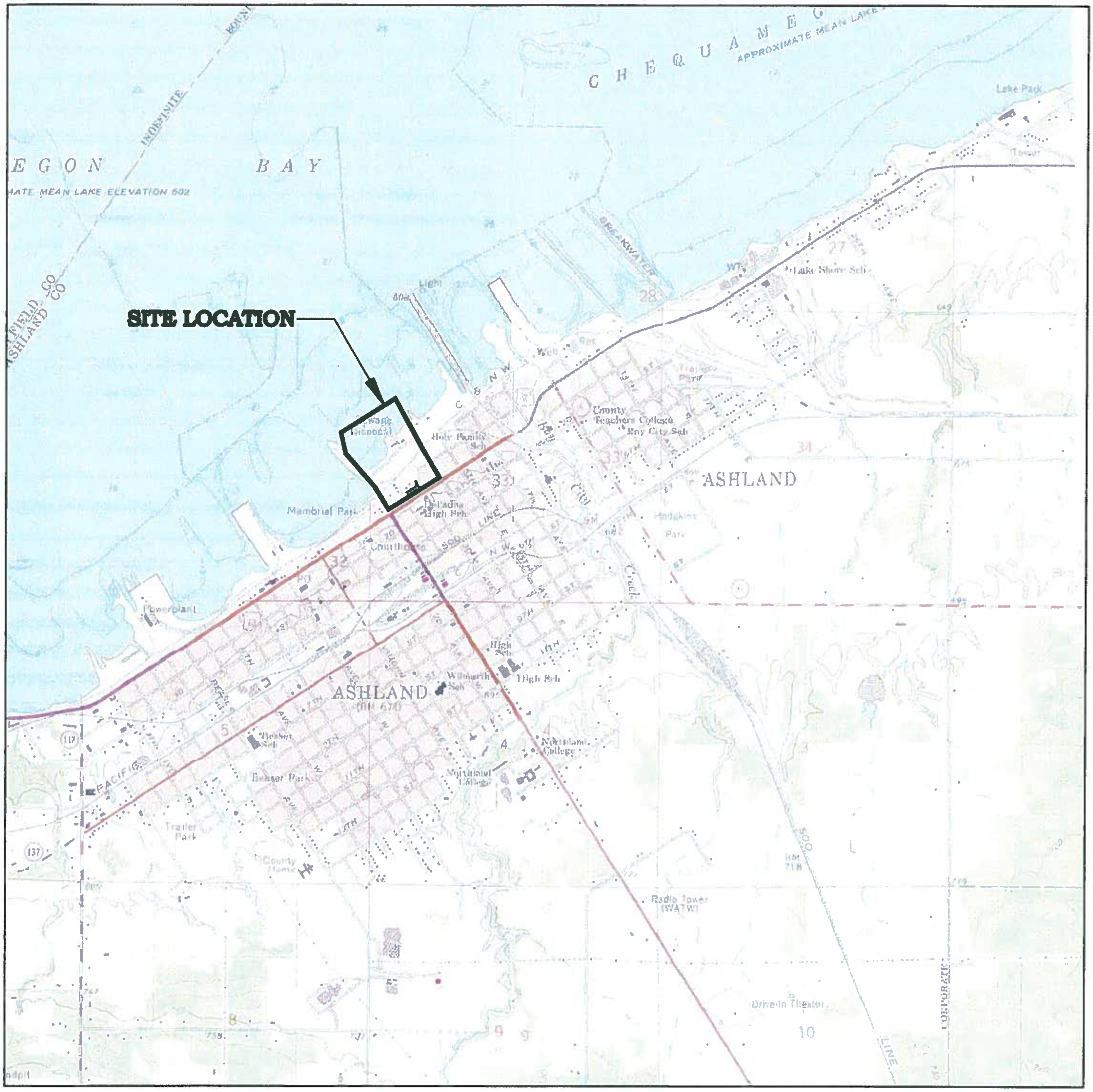
349949

National Remedy Review Board Consideration

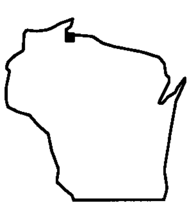
Ashland/NSP Lakefront Superfund Site

Ashland, Wisconsin

October 2008



BASE MAP SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, ASHLAND, WISCONSIN, DATED 1964, PHOTOREVISED 1975.



QUADRANGLE LOCATION

NORTH

0 1320 2640 5280

SCALE IN FEET

PROJECT:	ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN
TITLE:	FIGURE 1–1 SITE LOCATION

DRAWN BY: DDZ	SCALE: 1" – 2640'	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30.JULY.2007	SHEET: 1–1
APPROVED BY: DPT		

URS

10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100

A. Summary

1. Site Summary

Site name and location:	Ashland/NSP Lakefront Site Ashland, Ashland County, Wisconsin
Site account number:	2009 T 05F 302DD2C B5N5CO00 "Ashland/NSP Lakefront RI/FS"

Orientation to the key features of the site and surrounding area:

Ashland, Wisconsin is located on Lake Superior about 66 miles east of Superior (Figure 1-1).

On-site and surrounding land use:

The Northern States Power Company (NSPW), a Wisconsin corporation (d.b.a. Xcel Energy) facility is located at 301 Lake Shore Drive East in Ashland, Wisconsin. The facility lies approximately 1,000 feet southeast of the shore of Chequamegon Bay of Lake Superior (see Figures 1-1, 1-2 and 1-3). The NSPW property is occupied by a small office building and parking lot fronting on Lake Shore Drive, and a larger vehicle maintenance building and parking area located south of St. Claire Street between Prentice Avenue and 3rd Avenue East. The office building and vehicle maintenance building are separated by an alley. There is also a gravel-covered parking and storage yard area north of St. Claire Street between 3rd Avenue East and Prentice Avenue, and a second gravel-covered storage yard at the northeast corner of St. Claire Street and Prentice Avenue. A large microwave tower is located on the north end of the storage yard. Residences bound the site east of the office building and the gravel-covered parking area. Our Lady of the Lake Church and School is located immediately west of 3rd Avenue East. Private homes are located immediately east of Prentice Avenue. To the northwest, the Site slopes abruptly to the Canadian National (f.k.a. Wisconsin Central Limited) Railroad property at a bluff that marks the former Lake Superior shoreline and then to the City of Ashland's Kreher Park, beyond which is Chequamegon Bay. At the present time, Kreher Park is predominantly grass covered. A gravel overflow parking area for the marina occupies the west end of the property, while a miniature golf facility formerly occupied the east end of the park. The former City of Ashland waste water treatment plant (WWTP) and associated structures front the bay inlet on the north side of the property.

Brief site contamination history and facility operational history:

The Ashland/NSP Lakefront Site consists of property owned by NSPW, a portion of Kreher Park, and sediments in an offshore area (Chequamegon Bay) adjacent to Kreher Park. Historically, Chequamegon Bay has been utilized as a vital transportation route for the shipment of various materials to and from Ashland including iron ore, lumber, pulp and coal. During the late 19^{th} and early 20^{th} centuries, Ashland was one of the busiest ports in the Great Lakes. In recent times, the shipping volume through the bay has declined because of the decrease in the mining and lumber industries in the region.

The Kreher Park area is reclaimed land of which the south boundary defined the original lake shoreline. Beginning in the mid- to late- 1800's, this area was filled with a variety of materials including slab wood, concrete, demolition debris, municipal and industrial wastes and earthen fill that created the land now occupied by the park. The filled area was used for lumbering and sawmill activities. The lumbering and sawmill activities occurred during the deforestation of the northern portion of Wisconsin around the turn of the century. The John Schroeder Lumber Company was dissolved in the late 1930's. Ashland took possession of the property in 1941. In 1942, Ashland County transferred the title of the land to the City of Ashland. The area was vegetated at this time, and there may have been a ponded area of a black tarry substance. A 1953 map indicates a "Coal Tar Dump" was present at this time. Information also indicates that the property was used as a "dump" for solid waste, fly ash, and dredge spoils.

In 1951, the City of Ashland constructed a (now former) wastewater treatment plant (WWTP) at the Site. It operated until 1992. During the mid-1980s the marina extension of Ellis Avenue was completed to permit establishment of a marina with full service boat slips, fuel and dock facilities and a ship store. Prior to the construction of the marina, the area was a rail boat dock used for offloading freight. This was used for this purpose beginning with the sawmill operations through the marina construction. The boat landing jetty extension of Prentice has also been used for this purpose for several decades; it was originally the log boom associated with the former Schroeder sawmill formerly located on the site of the WWTP.

In 1989, during exploratory work to expand the WWTP into the Kreher Park area, contaminated soil and groundwater was encountered by the City of Ashland. The City notified the Wisconsin Department of Natural Resources (WDNR), and subsequently closed the WWTP, and built a new WWTP facility a few miles away to the northeast. In 1994, WDNR initiated an investigation and evaluation of the area to characterize the extent of contamination on the property.

On the upper bluff, a former Manufactured Gas Plant (MGP) was located on the NSPW property. The former MGP building has been incorporated into the main service facility on St. Claire Street. The former MGP operated predominantly as a manufacturer of water gas and carburetted water gas between 1885 and 1947. After 1947, the carburetted water gas process was retired in favor of liquid petroleum (propane). During the entire time gas was manufactured, coal tars were produced as a normal co-product.

The primary contaminants at the Site are derived from tar compounds, including volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbon (PAH) compounds. Additionally, some free-phase hydrocarbons product (free product) derived from the tars is present as a non-aqueous phase liquid (NAPL), and have impacted soils, groundwater, and offshore sediments. Free-product referenced in this document includes both light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL).

DNAPL has been encountered in the upper reaches of a filled ravine near the former MGP facility on the NSPW property, at isolated areas at Kreher Park including the former "seep" area, in the offshore sediments, and in the upper elevations of the Copper Falls Formation, which behaves as a confined aquifer near the former MGP at the upper bluff area. DNAPLs encountered in the filled ravine (near the former MGP facility) and at isolated areas at Kreher Park were encountered at the base of these fill units overlying the Miller Creek Formation. The Miller Creek Formation is the confining unit for the underlying Copper Falls aquifer. LNAPLs were also observed across much of Kreher Park as oily sheen in the underlying wood waste layer encountered during a test pit investigation at the Park.

Although DNAPL has also been encountered in off-shore sediment, it is less defined than on-shore locations due to the dynamic conditions in the affected sediments. DNAPLs in the deep aquifer correspond to high levels of VOCs in groundwater (> 50,000 µg/L), which is surrounded by a dissolved phase contaminant plume that extends north from the NAPL area in the direction of groundwater flow.

Media and primary COCs addressed by this proposed action:

The proposed action addresses hazardous substances, including VOCs, SVOCs, and PAHs in the aquifer underneath the former MGP, in soil on the upper-bluff and Kreher Park and in the sediments in Chequamegon Bay.

Operable units addressed by this action and the media addressed by each:

The Ashland NSP/Lakefront site has only one operable unit. The groundwater, soil, and sediment are impacted by high-levels of VOC, SVOC, and PAH contamination and all media will be addressed by the proposed cleanup action.

2. Risk Summary

<u>HHRA</u>

The results of the human health risk assessment (HHRA) indicate that three exposure pathways result in estimated risk levels exceeding EPA's target risk levels: residential exposure pathways (for soil depths between 0 and 3 feet or all soil depths to 10 feet bgs), construction worker exposure pathway (for soil depths between 0 and 10 feet) and worker exposures to indoor air. These include estimates for the reasonable maximum exposure conditions for potential cancer risks (greater than 10^{-4}), and non-cancer risks (greater than a hazard index of 1). These conclusions are based on exposures to soil in the filled ravine area (for residential receptors) and the Kreher Park area (for construction worker receptors), and to indoor air samples collected at NSPW Service

Center. Carcinogenic risks based on average exposure conditions indicate that only the residential receptor exposure to soil (all soil depths to 10 feet bgs) are estimated to be at 1 x 10^{-4}, the upper-end of the target risk range. Noncarcinogenic risks for the residential receptor (for all soil depths to 10 feet bgs) and risks associated with the construction scenario are within acceptable levels. However, residential receptor exposure to subsurface soil is not expected, given the current and potential future land use of the Site. For this Site, residential risks associated with exposures to surface soil (0 to 1 foot bgs) are within the target risk ranges.

Although the results of the HHRA indicate risks for the construction workers under the reasonable maximum exposure conditions exceed EPA's target risk levels, the assumptions used to estimate risks to this receptor were conservative and assumed the worst case. Given both the current and future land use of the Site, it is unlikely that construction workers would be exposed to subsurface soil in Kreher Park at depths beyond 4 feet bgs (a typical depth for the installation of underground utility corridors), as most activities associated with the implementation of the future land use would be associated with re-grading, landscaping, and road or parking lot construction. Therefore, risks to this receptor population from soil exposure are most likely overstated.

A hazard index of 3 was calculated for the worker exposure to indoor air pathway under the reasonable maximum exposure conditions. This risk level is likely to be an over-estimate because:

- It was estimated using the maximum detected concentrations as the concentrations at points of exposure.

- It was calculated based on the exposure parameters for the industrial /commercial workers (i.e., .an individual works at the Site for 8 hours per day, 5 days per week, 50 weeks per year for a total of 25 years). The NSPW Service Center is used as a warehouse; there is an office space inside the building, but used only on a part-time basis.

Risks to recreational users (surface soil), subsistence fishers (finfish), waders and swimmers (sediments), industrial workers (surface soil), and maintenance workers (surface soil) are all within EPA's target risk range of 10^{-4} to 10^{-6} for lifetime cancer risk and a target hazard index of less than or equal to 1 for non-cancer risk. However, risks for waders and swimmers could not be quantified due to the fact that samples were not collected during the time that sheens appeared on the surface water.

<u>*BERA*</u>

The baseline ecological risk assessment (BERA) studied nine groups of ecological receptors. The results identified no unacceptable risks to six of these endpoints (omnivorous birds, insectivorous birds, piscivorous birds, omnivorous mammals, insectivorous mammals, and piscivorous mammals). Two of the other endpoints also yielded data that showed no unacceptable risks (fish community and omnivorous aquatic birds); however, the data also showed that contaminants in sediment are sporadically released to the aquatic environment where these receptors are potentially exposed. The final receptor group which was studied included benthic invertebrates. The results of the risk characterization indicated that there are potentially unacceptable impacts to the benthic macroinvertebrate community in aquatic portions of the Site.

3. Remediation Goal

The specific goals of the remedial actions are defined by acceptable contaminant levels, or a range of levels at each location for each exposure route. The acceptable contaminant level (or protectiveness) is determined based on the findings of the HHRA and the BERA. The general goal of these objectives is to protect human health and environmental receptors at risk due to constituents at the site. These objectives are subject to the criteria evaluated in the FS, and include:

- Eliminate or reduce potential risks to human health and to aquatic and terrestrial animals and to the environment from exposure to contaminants;
- Eliminate future migration of contaminants to receptors;
- Eliminate on-site migration of contaminants;
- Eliminate or reduce contaminant migration to Chequamegon Bay;
- Remove or reduce free-product (NAPL) present at the upper bluff (filled ravine/NSPW property and the Copper Falls Aquifer);
- Remove or reduce free product (NAPL) at Kreher Park;
- Remove or reduce free product (NAPL) from the sediments in Chequamegon Bay;
- Minimize short-term risk to human health and to aquatic and terrestrial animals and to the environment from exposure to contaminants during the implementation of the remedial action.

The HHRA was based upon the protection of human health. The BERA was based upon a risk management goal of maintenance (or provision) of soil, sediment, water quality, food source, and habitat conditions capable of supporting a "functioning ecosystem" for the ecological populations inhabiting or using the Site. The HHRA was used to develop RAOs for soil, and the BERA was used to development RAOs for surface water and sediment. Although HHRA results indicate that groundwater is not currently used as a potable water supply, construction workers may encounter groundwater in a trench. RAOs for dissolved phase and free-phase (tar) groundwater contamination were also developed for groundwater. The development of RAOs is described in the following sections. RAOs for site media are summarized below.

Remedial Action Objective Summary by Site Media

Environmental Media	Receptor	Preliminary Remedial Action Objectives
Groundwater	Human Health	Protect human health by eliminating exposure (direct contact, ingestion, inhalation) to groundwater with COPCs in excess of regulatory or risk-based standards; reduce contaminant levels in groundwater to meet MCLs and State of Wisconsin Drinking Water Standards
	Environment (Ecological Receptors)	Protect the environment by controlling the off-site migration of contaminants in groundwater to surrounding surface water bodies which would result in exceedance of ARARs for COPCs in surrounding surface waters.
		Conduct free product removal to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water.
Soil	Human Health	Protect human health by reducing or eliminating exposure (ingestion/direct contact/inhalation) to soil having COPCs representing an excess cancer risk greater than 10^{-6} as a point of departure (with cumulative excess cancer risks not exceeding 10^{-5}) and a hazard index (HI) greater than 1 for reasonably anticipated future land use scenarios.
		Ensure future beneficial commercial/industrial use of the site and recreational use of Kreher Park.
	Environment (Ecological Receptors)	Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with or incidental ingestion of soils or prey) to soil with levels of COPCs that would pose an unacceptable risk.
		Conduct free product removal to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water.
		Protect the environment by minimizing/eliminating the migration of contaminants in the soil to groundwater or to surrounding surface water bodies.
Surface Water	Human Health	Protect human health by minimizing exposures (direct contact, ingestion, inhalation) to surface water that has been impacted by Site-related groundwater and sediment with concentrations of COPCs such that regulatory or risk-based surface water standards have been exceeded.
	Environment (Ecological Receptors)	Protect the environment by controlling the migration of contaminants in groundwater and in sediments to surface water which would result in exceedance of ARARs for COPCs in surface water.
		Reduce Site-related COPC levels in the surface water to meet State of Wisconsin Surface Water Quality Standards.
Sediments	Human Health	Protect human health by eliminating exposure (direct contact, ingestion, inhalation, fish ingestion) to sediment with COPCs in excess of regulatory or risk-based

Environmental Media	Receptor	Preliminary Remedial Action Objectives
		standards.
	Environment (Ecological Receptors)	Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with incidental ingestion of sediments or of prey) to sediment with levels of COPCs that would pose an unacceptable risk.
		Conduct free product removal to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water.

The basis and rationale for soil remediation objectives is protection of reasonable future uses. This includes industrial, commercial and utility worker protection and protection of recreational users of Kreher Park. The basis and rationale for groundwater remediation objectives is based on anticipated commercial/industrial and recreational land use. These objectives were developed to eliminate exposure and protect against off-site migration of contaminants. The basis and rationale for surface water remedial objectives are to minimize the potential for contaminant exposure to surface water users and reduce migration of groundwater and sediment contaminants to surface water that could result in exceedance of surface water standards. The basis and rationale for sediment remedial objectives are to protect populations of aquatic organisms, including fish, and to protect against migration of contaminants from sediments to surface water.

4. Description of Alternatives

EPA evaluated the alternatives shown in Tables 1 and 2 (pages 12 -18) for the entire site.

Potential remedial responses were reviewed for soil, groundwater, and sediment. The filled ravine and Kreher Park include remedial alternatives for both soil and groundwater. Remedial alternatives for the Copper Falls aquifer are limited to groundwater, and remedial alternatives for the offshore sediments are limited to sediment. Table 1 includes a summary of potential remedial alternatives for each area of concern consisting of the following:

- At the upper bluff area, 14 alternatives for remediating the "filled ravine";
- At the upper bluff area, 7 alternatives for remediating "Copper Falls aquifer";
- At the lakefront, 12 alternatives for remediating soil and groundwater; and
- In the lake, 16 alternatives for remediating offshore sediments.

5. Preferred Alternative

The Region prefers that **Remedial Scenario X** be implemented. The estimated cost is approximately $83.5 to $96.5 million. Major components of this remedial scenario include:

- **Sediments:** Alternative SED-6B – Using shore-based excavation equipment, remove in the dry all nearshore sediment and wood debris that exceeds 9.5 ppm total PAHs. In addition, remove wood debris from offshore sediments and mechanically or hydraulically dredge remaining offshore sediments that exceed 9.5 ppm total PAHs. After dredging is completed, place six inches of clean fill/fish mix on dredged areas. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site to NR 500 permitted landfill or thermal treatment. Dispose of or burn wood debris separately.
- **Kreher Park:** Alternative S-5A - Limited soil removal with ex-situ thermal treatment. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediments will be the alternate remedy, and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Filled Ravine:** Alternative S-5A - Limited soil removal with ex-situ thermal treatment. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediments will be the alternate remedy, and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Copper Falls Aquifer:** Enhance existing groundwater extraction system (GW-9B). In-situ chemical oxidation (GW-6) or in-situ treatment via ozone sparge (GW-3) can be used to possibly enhance groundwater treatment.
- **Conduct O&M and Long-Term Monitoring:** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **Institutional controls:** Implement groundwater use and deed restriction as part of remedial response at upper bluff and Kreher Park where contaminants remain in subsurface. Groundwater use restrictions for shallow groundwater in contained areas will also be required.

6. Stakeholder Views

WDNR:

WDNR would support the environmental cleanup of the Ashland site and support the City of Ashland's waterfront development project (letter attached).

Industry:

Local industry (Xcel Energy) has expressed support for the environmental cleanup of the Ashland Site. They have indicated that they would support any cleanup actions that would not cost too much (letter attached).

City of Ashland:

The city has expressed support for the environmental cleanup of the Ashland site in the past. The city has indicated that it would support any environmental cleanup that is protective and would help the City of Ashland complete their waterfront development project.

B. Detailed Information

1. Site Name, Location, and Brief Description

The Ashland NSP Lakefront Superfund Site (Site) consists of land and sediment located along the shore of Lake Superior, in Ashland, Wisconsin (see Figures 1-1, 1-2 and 1-3). The Site contains: (i) property owned by Northern States Power Company, a Wisconsin corporation (d.b.a. Xcel Energy, a subsidiary of Xcel Energy Inc. (NSPW)); (ii) a portion of Kreher Park, a City-owned property fronting on the bay which includes the former municipal WWTP structure; (iii) an inlet area containing contaminated sediment directly offshore from the former WWTP, and (iv) Our Lady of the Lake Church/School, as well as private residences. The Site is bounded by US Highway 2 (Lake Shore Drive) to the south, Ellis Avenue and its extension to the City marina to the west, Prentice Avenue and its extension to a boat launch to the east, and a line between the north termini of the marina and the boat launch to the north.

The NSPW property, located on an upper bluff fronting on Kreher Park, was originally used as manufactured gas plant (MGP) that operated between 1885 and 1947. The MGP began as a small producer of gas for street lighting and other residential and commercial uses, and expanded over the next several decades. The plant predominantly employed the carburetted water gas process to manufacture gas. The plant ceased operation in 1947 when the facility was dedicated to propane distribution. Since that time, the property has been used as an electrical repair shop and equipment storage facility first for Lake Superior District Power, and later by its current successor, NSPW.

Table 1: Ashland Remedial Alternatives

Table 1 - Summary of Remedial Alternatives by Areas of Concern

Area of Concern	FS Designation	Description
Filled Ravine	S-1/GW-1	No Action
	S-2	Containment Using Surface Barriers
	S-3A	Limited Removal and Off-site Disposal
	S-3B	Unlimited Removal and Off-site Disposal
	S-4A	Limited Removal and On-site Disposal at Kreher Park
	S-4B	Unlimited Removal and On-site Disposal at Kreher
	S-5A	Ex-situ Thermal Desorption - On-site treatment (limited removal)
	S-5B	Ex-situ Incineration - Off-site treatment (limited removal)
	S-6	On-site Soil Washing (limited removal)
	GW-2A	Containment Using Vertical Barriers
	GW-3	Ozone Sparge
	GW-6	In-site Chemical Oxidation
	GW-7	Electrical Resistance Heating
	GW-8	Steam Injection – Contained Recovery of Oily Water (CROW)
	GW-9A	Groundwater Extraction with EW-4
Copper Falls Aquifer	GW-1	No Action
	GW-3	Ozone Sparge
	GW-4	Dual Phase / Surfactant Injection
	GW-6	In-situ Chemical Oxidation
	GW-7	Electrical Resistance Heating
	GW-8	Steam Injection via Dynamic Underground Stripping (DUS)
	GW-9A	Groundwater Extraction with existing system
	GW-9B	Groundwater Extraction with enhanced groundwater extraction system
Kreher	S-1/GW-1	No Action

Table 1 - Summary of Remedial Alternatives by Areas of Concern

Area of Concern	FS Designation	Description
	S-2	Containment Using Surface Barriers
	S-3A	Limited Removal and Off-site Disposal
	S-3B	Unlimited Removal and Off-site Disposal
	S-5A	Limited Removal and On-site Disposal at Kreher Park
	S-5B	Unlimited Removal and On-site Disposal at Kreher Park
	S-6	Ex-situ Thermal Desorption - On-site treatment (limited removal)
	GW-2A	Containment using vertical barriers (with hydraulic control of contained
	GW-2B	Containment using vertical barriers (with hydraulic control of contained
	GW-3	Ozone Sparge
	GW-5	Containment Using Vertical Barriers and Permeable Reactive Barrier
	GW-6	In-site Chemical Oxidation
	GW-7	Electrical Resistance Heating
	GW-8	Steam Injection via Dynamic Underground Stripping (DUS)
	GW-9B	Groundwater Extraction with enhanced groundwater extraction system
Offshore Sediments	SED-1	No Action
	SED-2	Confined Disposal facility (CDF)
	SED-3A	Dredge and Subaqueous Cap with Mechanical Dredge (No treatment
	SED-3B	Dredge and Subaqueous Cap with Mechanical Dredge (Thermal Treatment prior to off-site disposal)
	SED-3C	Dredge and Subaqueous Cap with Hydraulic Dredge (No treatment prior to off-site disposal)
	SED-3D	Dredge and Subaqueous Cap with Hydraulic Dredge (Thermal Treatment prior to off-site disposal)
	SED-4A	Dredge all with Mechanical Dredge (No treatment prior to off-site disposal)
	SED-4B	Dredge all with Mechanical Dredge (Thermal Treatment prior to off-site disposal)

Table 1 - Summary of Remedial Alternatives by Areas of Concern

Area of Concern	FS Designation	Description
	SED-4C	Dredge all with Hydraulic Dredge (No treatment prior to off-site disposal)
	SED-4D	Dredge all with Hydraulic Dredge (Thermal Treatment prior to off-site disposal)
	SED-5A	Dry Excavation
	SED-5B	Dry Excavation (Thermal Treatment prior to off-site disposal)
	SED-6A	Combination Dry Excavation Nearshore/Mechanical Dredging Offshore (No treatment prior to off-site disposal)
	SED-6B	Combination Dry Excavation Nearshore/Mechanical Dredging Offshore (Thermal Treatment prior to off-site disposal)
	SED-6C	Combination Dry Excavation Nearshore/Hydraulic Dredging Offshore (No treatment prior to off-site disposal)
	SED-6D	Combination Dry Excavation Nearshore/Hydraulic Dredging Offshore (Thermal Treatment prior to off-site disposal)

Table 2 Summary of Integrated Remedial Scenarios

Remedial Scenario	I	II	III	IV	V	VI	VII	VIII	IX	X
Sediment	Not Applicable	Dredge sediment up to four feet and cap remaining sediment in place **(SED-3).**	Dredge (hydraulic or mechanical) all sediment exceeding 9.5 ppm **(SED-4).**	Dredge (hydraulic or mechanical) all sediment exceeding 9.5 ppm **(SED-4).**	Confined Disposal Facility (CDF) for near shore sediment and material dredged outside of CDF footprint **(SED-2).**	Dry excavation of all sediment exceeding 9.5 ppm **(SED-5).**	Dry excavation of all sediment exceeding 9.5 ppm **(SED-5).**	Dredge (hydraulic or mechanical) all sediment exceeding 9.5 ppm **(SED-4).**	Dry excavation of all sediment exceeding 9.5 ppm **(SED-5).**	Removal of all sediment exceeding 9.5 ppm. Dry excavation nearshore/ mechanical dredging offshore **(SED-6)**
Kreher Park	Not Applicable	Surface barriers to prevent direct contact and limit leaching from unsaturated zone **(S-2).**	Limited soil / source removal via off site disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B**, or soil washing **(S-6)**, and groundwater remediation via enhanced groundwater extraction for hydraulic control **(GW-9B).** -	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with partial caps and hydraulic control **(GW-2A)**, or with	CDF at Kreher Park combined with engineered surface and vertical barriers for soil and groundwater contamination at Kreher Park **(GW-2B).**	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with hydraulic control via groundwater extraction using, partial	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, soil washing **(S-6)**, in-situ chemical oxidation **(GW-6)**, ERH **(GW-7)**, or steam injection **(GW-8)**, and groundwater remediation via ozone sparge **(GW-3)** or enhanced	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, soil washing **(S-6)**, in-situ chemical oxidation **(GW-6)**, ERH **(GW-7)**, or steam injection **(GW-8)**, and groundwater remediation via engineered surface and vertical	Unlimited removal of unsaturated and saturated and off-site disposal **(S-3B).**	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with partial caps and hydraulic control **(GW-2A)**, or with

Table 2 Summary of Integrated Remedial Scenarios

Remedial Scenario	I	II	III	IV	V	VI	VII	VIII	IX	X
				PRB wall **(GW-5).**		caps for the park **(GW-2A)**, a cap for entire park **(GW-2B)**, or with a PRB wall **(GW-5)** at Kreher Park.	groundwater extraction **(GW-9B)**.	barriers with hydraulic control via groundwater extraction and using a cap for the entire park **(GW-2B)**, or with a PRB wall **(GW-5)** at Kreher Park.		PRB wall **(GW-5).**
Filled Ravine	Not Applicable	Surface barriers to prevent direct contact and limit leaching from unsaturated zone **(S-2)**.	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater extraction using the existing system **(GW-9A)**.	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with partial caps and	Soil remediation via limited soil / source removal and onsite disposal **(S-4A)**, and groundwater remediation using existing groundwater extraction system **(GW-9A)**, or soil and groundwater remediation via unlimited removal and onsite disposal **(S-**	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with hydraulic control via	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, soil washing **(S-6)**, in-situ chemical oxidation **(GW-6)**, ERH **(GW-7)**, or steam injection **(GW-8)**, and groundwater remediation via ozone	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, soil washing **(S-6)**, in-situ chemical oxidation **(GW-6)**, ERH **(GW-7)**, or steam injection **(GW-8)**, and groundwater remediation via	Unlimited removal of unsaturated and saturated and off-site disposal **(S-3B)**.	Limited soil / source removal via offsite disposal **(S-3A)**, ex-situ thermal desorption **(S-5A)**, offsite incineration **(S-5B)**, or soil washing **(S-6)**, and groundwater remediation via engineered surface and vertical barriers with partial caps and

Table 2 Summary of Integrated Remedial Scenarios

Remedial Scenario	I	II	III	IV	V	VI	VII	VIII	IX	X
				hydraulic control **(GW-2A)**, or with PRB wall **(GW-5)** at Kreher Park.	**4A)**.	groundwater extraction, and partial caps and **(GW-2A)**, or with PRB wall **(GW-5)** at Kreher Park.	sparge **(GW-3)** or groundwater extraction from EW-4 with existing system **(GW-9A)**.	engineered surface and vertical barriers with hydraulic control via groundwater extraction (at Kreher Park) and, and partial caps and **(GW-2A)**, or with PRB wall **(GW-5)** at Kreher Park.		hydraulic control **(GW-2A)**, or with PRB wall **(GW-5)** at Kreher Park.
Copper Falls	Not Applicable	Groundwater / NAPL extraction using the existing system **(GW-9A)**	Groundwater and NAPL remediation via ozone sparge **(GW-3)** or surfactant injection /dual phase recovery **(GW-4)**, and groundwater / NAPL extraction using the existing system **(GW-9A)**, or in-situ chemical	Groundwater remediation via ozone sparge **(GW-3)**, surfactant injection /dual phase recovery **(GW-4)**, and groundwater extraction with the existing system **(GW-9A)**, or in-situ chemical oxidation **(GW-6)**,	Groundwater remediation via ozone sparge **(GW-3)**, surfactant injection /dual phase recovery **(GW-4)**, and groundwater extraction with the existing system **(GW-9A)**, or in-situ chemical oxidation **(GW-6)**, ERH **(GW-7)**, steam	Groundwater remediation via ozone sparge **(GW-3)**, surfactant injection /dual phase recovery **(GW-4)**, and groundwater extraction with the existing system **(GW-9A)**, or in-situ chemical oxidation **(GW-6)**,	Groundwater remediation via enhanced groundwater extraction **(GW-9B)**.	Groundwater remediation via ozone sparge **(GW-3)**, surfactant injection /dual phase recovery **(GW-4)**, and groundwater extraction with the existing system **(GW-9A)**, or in-situ chemical oxidation **(GW-6)**,	Groundwater remediation via enhanced groundwater extraction **(GW-9B)**.	Groundwater remediation via ozone sparge **(GW-3)**, surfactant injection /dual phase recovery **(GW-4)**, and groundwater extraction with the existing system **(GW-9A)**, or in-situ chemical oxidation **(GW-6)**,

Table 2 Summary of Integrated Remedial Scenarios

Remedial Scenario	I	II	III	IV	V	VI	VII	VIII	IX	X
			oxidation **(GW-6),** ERH **(GW-7)**, steam injection **(GW-7),** or enhanced groundwater extraction **(GW-9B).**	ERH **(GW-7)**, steam injection **(GW-7),** or enhanced groundwater extraction **(GW-9B).**	injection **(GW-8),** or enhanced groundwater extraction **(GW-9B).**	ERH **(GW-7)**, or steam injection **(GW-8).**		ERH **(GW-7)**, steam injection **(GW-8),** or enhanced groundwater extraction **(GW-9B).**		ERH **(GW-7)**, steam injection **(GW-7),** or enhanced groundwater extraction **(GW-9B).**

Kreher Park includes lands formed from the filling of the bay during the late 1800s and early 1900s when the area was the site of major lumbering operations. These operations began in 1884 with the Barber Mill, which shortly changed ownership to the Sutherland Mill and then the Pope Mill over the succeeding 17 years. In 1901, the John Schroeder Lumber Company acquired the property and continued to expand lumber operations and shipping facilities on the lakefront. Schroeder's operations may have included wood treatment. Schroeder ceased operation around 1931, but owned the property until 1939. Ashland County then took ownership through a bankruptcy action in 1941, and subsequently transferred the title to the City of Ashland in 1942.

The lakefront property was utilized for the uncontrolled disposal of MGP waste (primarily tar through the ravine). Solid wastes, primarily demolition debris, were disposed along the western side of the property in the 1940s. The City's WWTP was constructed in the early 1950s, expanded in the 1970s and continued to operate through the early 1990s. Since the City's ownership, numerous construction activities that resulted in substantial filling operations continued. These included the aforementioned waste disposal operation, construction in the early 1950s (and expansion in the early 1970s) of the WWTP, and construction of the City's marina in the mid-1980s. Marina construction included construction of boat slips and the extension of Ellis Avenue, which forms the western boundary of the Site.

In 1989 during exploratory drilling in preparation for another planned WWTP expansion, the City encountered coal tar contamination in the area south of the plant. The City notified the WDNR. The plant was ultimately relocated southeast of the City. Since the early 1990s, the WWTP has remained dormant. Since that time, the Kreher Park area has been used only for minor recreational purposes (a one-time miniature golf facility) and dry-dock marina boat storage.

2. Site History and Enforcement Activities

<u>Site History</u>

The discovery of contaminants at Kreher Park initiated several investigations that culminated in the identification by the WDNR of the former MGP, and the naming of NSPW as a potentially responsible party (PRP) for the MGP wastes/contamination at the site. The City of Ashland and an operating railroad were named as PRPs for solid wastes disposed on their properties, in the mid- to late-1990s. The WDNR and NSPW subsequently performed a series of independent investigations to assess the extent of contamination at Kreher Park and the NSPW property, respectively.

<u>Enforcement</u>

An initial evaluation by WDNR in 1994 prompted the agency to issue a responsible party notice letter to NSPW in March 1995. NSPW then authorized Dames & Moore, now URS, to begin a series of investigations at its property that year. At approximately the same time, WDNR authorized its consultant SEH to investigate the Kreher Park area of the Site.

URS performed several investigations during the next several years to characterize the extent of contamination in the buried ravine and Copper Fall aquifer. The investigations identified subsurface contamination resulting from historic MGP operations. NSPW installed an interim action coal tar recovery system on its property to remove coal tar from the Copper Falls aquifer during the summer/fall of 2000, and the system became fully operational in January 2001. In addition, NSPW performed a second interim response action during May 2002 to cap the seep area. Capping the seep was necessary to address a direct contact threat with oil/tar contaminants.

In 1998, NSPW signed a Spill Response Agreement with WDNR to complete remedial action options reports (feasibility study) on both its property and Kreher Park/bay sediment areas. The Kreher Park and bay sediment areas of the Site were evaluated as an alternative feasibility analysis to an SEH study performed for WDNR and issued in a December 1998 report. URS prepared two separate reports, one for the NSPW property, and the other for the Kreher Park/bay sediments. Both reports were issued in March 1999. NSPW and WDNR subsequently began a process of technical discussions designed to result in a remedial action decision for the Site. In the spring 1999, a local environmental group petitioned the United States Environmental Protection Agency (EPA) to evaluate the Site for scoring on the national priorities list (NPL) for Superfund. Because of the petition, the WDNR and NSPW held in abeyance further efforts toward the remedial action decision-making process. The Site was nominated in 2000, and formally added to the NPL in 2002. NSPW subsequently signed an administrative order on consent (AOC) with EPA in 2003 to conduct a remedial investigation/feasibility study (RI/FS) at the Site. The scope of the RI was to fill data gaps identified from earlier investigations and develop remedial alternatives for the Site. The RI investigation activities were completed in November 2005. The RI was approved by EPA in October 2007.

3. Scope and Role of Operable Unit or Response Action

Ashland NSP/Lakefront site has only one operable unit. The groundwater, soil, and sediment are impacted by high-levels of VOC, SVOC, and PAH contamination and all media will be addressed by the proposed cleanup action.

4. Site Characteristics

Site geologic and hydrogeologic conditions have been determined from previous investigations and from the supplemental investigations conducted during the RI activities completed in 2005. Historic investigations included the visual classification of subsurface soil units from numerous soil borings, monitoring well boreholes and exploration test pits. Supplemental investigations completed for the RI included the installation of additional monitoring wells, the collection of surface and subsurface soil samples from borings and test pits, and a downhole geophysical survey. Geologic units investigated at the Site include the Miller Creek Formation and underlying Copper Falls Formation. Fill soil units were also encountered at the upper bluff and at Kreher Park. At the upper bluff area, fill soil was encountered in a former ravine that dissected the Miller Creek Formation in the vicinity of the former MGP facility. Kreher Park consists of fill material on a former lakebed.

The uppermost water bearing unit at the upper bluff area includes the Miller Creek Formation. Groundwater is also encountered in the fill material used to backfill the former ravine that dissected the Miller Creek Formation in the vicinity of the former MGP facility. The uppermost water bearing unit at Kreher Park consists of material used to fill the former lakebed; this fill material overlies the Miller Creek Formation. The fine-grained low permeability Miller Creek Formation creates an aquitard overlying the Copper Falls aquifer, behaving as a confining unit.

Previous investigations have identified groundwater contamination in the ravine fill, the Kreher Park fill and the underlying Copper Falls aquifer. Groundwater contamination in the underlying Copper Falls aquifer is the result of former MGP operations. Contaminants, including nonaqueous phase liquids (NAPL), migrated to the underlying Copper Falls aquifer in the vicinity of the former MGP facility where the Miller Creek Formation lacks plasticity and where vertical hydraulic gradients indicate downward flow in the Copper Falls aquifer. These migration pathways may have been exacerbated by construction operations during the early life of the MGP. Strong upward gradients have likely limited the vertical migration of contaminants at downgradient locations north of this area. The transition from downward to upward gradients within the Copper Falls aquifer occurs at the alley immediately south of the NSPW service center. Site investigation results indicate that contaminants in the Copper Falls aquifer have migrated laterally along the interface between the Copper Falls aquifer and overlying Miller Creek aquitard.

Nature and Extent of Contamination

The contaminants at the Site are typical manufactured gas plant wastes. These include VOCs and a subgroup of the larger list of SVOCs known as PAHs. The most abundant compounds from each of these groups include benzene (VOCs) and naphthalene (PAHs). Soils and groundwater at the Site are contaminated with these compounds, as are the offshore sediments in the affected inlet. Additionally, tar is present as DNAPL in the upper reaches of the filled ravine on the NSPW property south of St. Claire Street, and in the vicinity of a clay pipe encountered at the base of the ravine on the north side of the Street. It is also present at isolated areas at Kreher Park, including the former "seep" area and north of the former WWTP, in an area parallel to the shoreline extending across the historic lakebed northwest of the former WWTP, and in the upper elevations of the deep Copper Falls aquifer. The DNAPL in the deep aquifer has resulted in a dissolved phase contaminant plume that extends north from the DNAPL zone in the direction of groundwater flow, toward the bay. However, the thick clay aquitard (the Miller Creek Formation) provides a hydraulic barrier that separates the deep aquifer from the shallow groundwater encountered in Kreher Park fill and the bay waters in the area of the affected inlet. This separation is demonstrated by the strong artesian pressures measured at Kreher Park wells that are screened in the Copper Falls aquifer.

NSPW implemented interim removal actions in 2000 and 2002 to mitigate exposure risks to contaminants and to recover tar from the deep aquifer. A low-flow pumping system currently extracts groundwater and free product from the deep aquifer, treating the entrained groundwater before discharging it to the City of Ashland's sanitary sewer. Additionally, NSPW installed an extraction well at the base of the former filled ravine that was the source of the seep discharge at Kreher Park. This extraction well was part of a larger interim action that included excavation of contaminated materials at the former seep area and placement of a low-permeability cap to eliminate the intermittent seep discharge and mitigate environmental exposure of the associated contaminants.

The remaining hot spots of contamination at the Site consist of discrete DNAPL zones derived from the tars that exist within each of the following locations:

1. In the filled ravine on the NSPW property;
2. At isolated areas at Kreher Park including the former "seep" area and former coal tar dump area;
3. In the offshore sediments; and
4. In the upper elevations of the deep Copper Falls aquifer.

The lateral extent of shallow and deep groundwater contamination is shown on Figures 3-2 and 3-3. The area of impacted sediment is shown on Figure 4-213. The lateral extent of DNAPL in the filled ravine and Copper Falls aquifer is also shown on Figures 3-2 and 3-3. A description of the nature and extent of contamination in each area follows.

Filled Ravine

DNAPL has been encountered at the base of the filled ravine located south of St. Claire Street beneath the NSPW service center building and adjacent asphalt courtyard area. Part of this building includes an older section incorporating the former MGP building, and gas holders for the MGP are located within the filled ravine (see Figure 1-3). The depth of the center of the ravine in this area ranges from 15 to 20 feet below ground surface. The former ravine dissected the Miller Creek formation, which is the uppermost unconsolidated geologic unit in the Ashland area. This low permeability silty-clay/clayey silt unit is encountered at the base and flanks of the filled ravine. A perched aquifer has formed in the filled ravine because the fill material, which includes cinders, debris, and other locally derived detritus, is more permeable the surrounding native soil unit. Groundwater encountered within four to six feet of the ground surface is in hydraulic connection with the regional water table that extends across Site within the Miller Creek Formation.

Soil and groundwater in the filled ravine are contaminated largely by contact/proximity with the DNAPL on the south side of St. Claire Street. Contamination within the filled ravine downgradient from this area (beneath St. Claire and on the north side of St. Claire) has also been encountered. DNAPL was encountered in and around a 12-inch clay tile encountered at the base of the filled ravine on the north side of St. Claire Street during a 2001 investigation. This clay tile was found to extend beyond the mouth of the filled ravine to the former seep area at Kreher Park. This discharge was eliminated in 2002 with the installation of an interception well (EW-4) at the mouth of the former ravine following the removal of contaminated soil and cap installation at the seep area. Although DNAPL or LNAPL has not been encountered in EW-4, groundwater currently extracted from the filled ravine is conveyed to the existing tar removal system for treatment prior to discharge to the sanitary sewer.

Kreher Park

Based on current data, the impacted area of Kreher Park consists of a flat terrace adjacent to the Chequamegon Bay shoreline. The surface elevation of the park varies approximately 10 feet, from 601 feet above MSL to about 610 feet above MSL at the base of the bluff overlooking the park. The bluff rises to an elevation of about 640 feet above MSL, which corresponds to the approximate elevation of the NSPW property. The lake elevation has historically fluctuated about two feet, from 601 to 603 feet above MSL. At the present time, the park area is predominantly grass covered. A gravel overflow parking area for the Ashland Marina occupies the west end of the property, while a miniature golf facility formerly occupied the east end of the site. The City of Ashland former WWTP and associated structures front the shoreline on the north side of the property. The impacted area of Kreher Park occupies approximately 13 acres and is bounded by Prentice Avenue and a jetty extension of Prentice Avenue to the east, the Canadian National Railroad to the south, Ellis Avenue and the marina extension of Ellis Avenue to the west, and Chequamegon Bay to the north.

At Kreher Park, DNAPL is present at the seep area and in the former coal tar dump area north of the mouth of the filled ravine at Kreher Park. DNAPL-contaminated soil above the wood waste layer was removed from the seep area in 2002 and replaced with clean fill. In the former coal tar dump area, DNAPL-contaminated soil was encountered beneath several feet of clean fill overlying the wood waste layer. In both areas, DNAPL remains in the underlying wood waste layer, which underlies the entire Park.

Contaminated soil and groundwater conditions are widespread across the entire park area. Elsewhere at Kreher Park, contaminants were encountered in the wood waste layer beneath several feet of clean surficial soil. An LNAPL sheen was also observed in this wood waste layer, which was encountered at test pits locations throughout Kreher Park during the test pit investigation. Areas at Kreher Park with LNAPL yielded total VOC concentrations in groundwater below 5,000 µg/l, significantly lower than VOC concentrations associated with DNAPL (> 50,000 µg/l).

Offshore Sediment

The offshore area with impacted sediments is located in a small bay created by the Prentice Avenue jetty and marina extensions previously described. For the most part, contaminated sediments are confined within this small bay by the northern edge of the line between the Prentice Avenue jetty and the marina extension. The affected sediments consist of lake bottom sand and silts, and are mixed with wood debris likely originating from former log rafting and lumbering operations. The wood debris layer is up to seven feet thick in areas, with an average thickness of nine inches. Wood debris overlays approximately 95% of the impacted sediments. Based on current data, the entire area of impacted sediments encompasses approximately sixteen acres based upon a Preliminary Remediation Goal (PRG) for sediment of 9.5 µg PAH /g @ 0.415% Organic Carbon (OC).

NAPL is also present in some sediments in the offshore zone along the Kreher Park shoreline, mainly at the sand/wood waste interface (historic lakebed). The most NAPL is in the area between the marina and an area north of the former WWTP from 100 to 300 feet from the shore. NAPL is found at depths up to four feet below the wood waste/water interface in this zone and at depths up to 10 feet between the former WWTP and the boat launch.

Copper Falls Aquifer

A DNAPL mass is present underlying the Miller Creek Formation in the same area of the NSPW service center. This material is found within the upper reaches of the Copper Falls aquifer, a sandy, coarse grained unit. DNAPL extends from depths of approximately 30 to 70 feet. The greatest thickness of DNAPL is present directly south of St. Claire Street within the main access drive of the NSPW service center. It thins in all directions from this area. The lateral extent of DNAPL in the underlying Copper Falls aquifer is shown on Figures 3-2 and 3-3.

NSPW has maintained a free product recovery system consisting of three extraction wells since the system was installed in 2000. Although this is a low flow pumping system, groundwater is used as a carrier to remove free product (NAPL), which necessitates the removal of groundwater. Through April 2008, 1.98 million gallons of contaminated groundwater have been removed from the Copper Falls aquifer. A significant percentage (99.3 percent) of this volume extracted is water. An oil/water separator is used to separate NAPL from water. Contaminated water is then treated by carbon filtration prior to discharge to the sanitary sewer system. NAPL is placed in a storage tank and periodically transported off-site for disposal. Through April 2008, approximately 9,700 gallons of NAPL has been separated from groundwater for off-site disposal (0.7% of the total volume removed).

Although the carburetted water gas process used by the former MGP likely generated tar-water emulsions (typically 10% oil/tar and 90%water), NAPL with low water content is separated from the recovered groundwater. Analysis of free product/NAPL ("oil") samples collected from the storage tank yielded NAPL water contents of 0.17 and 4.34 percent.

Hydrogeologic conditions at the Site have restricted the migration of contaminants in the underlying Copper Falls aquifer. The fine grained low permeability Miller Creek Formation behaves as a confining unit (aquitard) for the Copper Falls as indicated by strong upward vertical gradients that increase with depth in nested wells screened in this unit. These strong upward gradients have resulted in the migration of the plume in the upper Copper Falls along the interface with the Miller Creek. Although it has been determined that groundwater flow in the upper bluff area is to the north toward Chequamegon Bay, the lateral extent of contamination beneath Kreher Park is limited by a stagnation zone located between the shoreline and the bluff face. This stagnation zone has formed in response to an increase in the thickness of the Miller Creek aquitard toward the shoreline, which results in an increase in the artesian pressure in the underlying confined aquifer. Wells screened in the aquifer north of the bluff face forming the boundary between Kreher Park and the NSPW property are flowing (artesian) wells. This stagnation zone is characterized by a trough of low artesian pressure located near the center of the Park between the shoreline and at the bluff face. In the deeper portions of the Copper Falls aquifer groundwater likely flows beneath Chequamegon Bay. Additional wells may be needed to ensure that contaminants are not migrating beyond the shoreline in deeper portions of the Copper Falls aquifer.

<u>Fate and Transport</u>

The source of the contamination at the Site was caused primarily by the MGP that began in the 1880's and continued until the mid-20th century although other minor sources may have also impacted the area. Although contaminant sources were no longer active after that time, continued filling activities may have further dispersed these contaminants.

The primary source of contamination at the upper bluff/filled ravine, Kreher Park, Copper Falls aquifer and Chequamegon Bay is from the historic MGP operations. Contamination likely resulted from discharge of waste tars generated from the carburetted water gas manufacturing process. The tar material accumulated at the base of the ravine fill in the immediate area of the MGP facilities south of St. Claire Street and was dispersed throughout the inlet prior to filling at Kreher Park.

The tar has migrated from the MGP area through the ravine and later through the clay tile pipe system and open sewer into the bay and contaminated the bay impacting the sediments. The migration of this material to the Copper Falls aquifer also occurred where the overlying Miller Creek Formation is less plastic and hydrogeologic conditions allow downward flow conditions. This area is south of the alley behind the present NSPW service center.

Waste tars released during MGP operations migrated through the ravine fill and the buried clay tile to the base of the former ravine. The source of the NAPL at the seep was the MGP. The tile was likely part of a sewer system installed during the early operation of the MGP most likely in response to a 1902 City of Ashland sewer ordinance requiring the underground discharge of MGP wastes. However, the NAPL mass found south of St. Claire Street indicates this material was released at least in part and not entirely captured by this pipe system. Following backfilling of the ravine, releases of NAPL likely continued through the clay tile pipe. This material migrated to the downstream end of the tile, likely later connected to a second tile system identified during the 2005 RI. This tile paralleled the bluff face and was traced to the location of an upstream inlet of a former open sewer identified at the west side of Kreher Park. Once the open sewer was abandoned, NAPL then discharged through breeches in the pipe network, such as at the seep.

The transport of NAPL to the sediments likely resulted from a combination of effects. Direct discharge of wastes through the open ravine to the inlet prior to its filling is one source. Discharges of wastes from the open sewer prior to its filling and abandonment constitute another source. The wastes came primarily from the MGP, and potentially from other upland locations connected to the open sewer. Additionally, based on the distribution of NAPL in the sediments, other discharge points in addition to the open sewer could be present. It is likely that the distribution of this material has been affected by construction and filling activities that continued following cessation of other lakefront operations.

The highest levels of VOC contaminants at Kreher Park are found at areas corresponding to NAPL zones. These are comparable with levels near other NAPL zones at the upper bluff/filled ravine and Copper Falls aquifers. The levels are consistent for both soil and groundwater. Because of the high mobility and high solubility of the VOCs, the high permeability/flat horizontal groundwater gradient has led to widespread VOC contamination in groundwater at Kreher Park. However, these levels are generally an order of magnitude lower than samples collected near the NAPL areas.

In contrast, the soil data from Kreher Park show the opposite relationship regarding PAHs, with an order of magnitude increase in PAH levels across the majority of the park compared to the upper bluff/filled ravine. The PAHs are less mobile and less soluble compared to the VOCs, degrading more slowly. This chemical behavior combined with the physical characteristics in the fill material have created conditions for the PAHs to remain present and at similar levels in the fill since they were first released. The highest levels are most pronounced in the area of the former coal tar dump. Another potential source is the off-loading of fuel feedstocks or other raw materials to support the MGP and other lakefront industrial activity.

Contaminants in the affected sediments likely originated from the MGP operation with the potential addition from other minor sources. One transport mechanism was the ravine/clay tile pipe and open sewer when it was functional.

5. Current and Potential Future Site and Resource Uses

Land Use

Current and future uses of the Site include recreational users/visitors, residential (in established residential areas on top of the bluff near the Xcel Energy office), fishers (both recreational and potentially subsistence), and construction, maintenance and industrial workers. Trespassers are also likely under current conditions in the abandoned WWTP area. Future use of the Kreher Park portion of the Site does not include a residential scenario. However, the City of Ashland has a proposed Waterfront Development Plan for the lakefront and Kreher Park area that includes a possible new marina and an updated park.

Groundwater and Surface Water Use

Lake Superior is a source of drinking water for many area communities including Ashland; however, the water intake is several thousand feet out into the lake and is not located in the Chequamegon Bay. Thus, surface water as a source of drinking water (for Ashland) is not an issue for this site.

In addition, the Lake Superior basin is one of the most pristine and unique ecosystems in North America. Containing the largest surface area of any freshwater lake in the world, Lake Superior has some of the most breathtaking scenery in the Great Lakes and serves as a backdrop to a wide range of recreational and outdoor activities enjoyed by people from all over the world. Sparsely populated even today, Lake Superior has not experienced the same level of development, urbanization, or pollution as the other Great Lakes. Recognizing this unique and invaluable resource, the federal, state, provincial, and U.S. tribal governments, First Nations, environmental groups, industry and the public have taken steps to protect this great legacy for generation to come. This shared partnership has served as a model the world over for cooperative binational resource management. The Great Lakes Water Quality Agreement (GLWQA) between U.S. and Canada commits the two countries (the Parties) to address the water quality issues of the Great Lakes in a coordinated fashion.

Groundwater use might be an issue on this site. The City of Ashland has two artesian wells located in the Kreher Park area. They were taken out of use during implementation of the RI when it was determined that the wells could likely intercept contamination. Data from the RI showed that COPCs from the Site were detected, however, the results were below State and/or Federal groundwater quality standards. The City is very interested in utilizing these artesian wells in the future.

6. Summary of Risk

<u>Human Health Risk</u>

The results of the human health risk assessment (HHRA) for the Site indicate that seven exposure pathways result in estimated risks that exceed EPA's target risk levels (an incremental cancer risk [CR] of 10^{-4} to 10^{-6} and a hazard index [HI] ≤ 1) and eight exposure pathways result in estimated risks that are either equivalent to or exceed the WDNR's threshold of (i.e., CR ≤1×10^{-5} and HI ≤ 1). These exceedances are indicated below.

Exceeds EPA Threshold (CR ≥ 1×10^{-4} or HI >1)	**Exceeds WDNR Threshold (CR ≥ 1×10^{-5} or HI >1)**
Residents (Soil [0-3 feet and all soil depths] - Cancer)	Residents (Soil [0-3 feet and all soil depths] - Cancer)
–	Residential Child (Soil – Noncancer)
Construction Worker (Soil [0-10 feet bgs]/Groundwater)	Construction Worker (Soil [0-10 feet bgs]/Groundwater)
Construction Worker (Trench Air)	Construction Worker (Trench Air)
Adult Swimmer (Surface Water)	Adult Swimmer (Surface Water)
Adult Wader (Surface Water/Oil Slicks)	Adult Wader (Surface Water/Oil Slicks/Sediment)
Industrial Worker (Indoor Air)	Industrial Worker (Indoor Air)
Subsistence Fisher (Biota)	Subsistence Fisher (Biota)

HI: Hazard index for noncarcinogenic effects

These include estimates for the reasonable maximum exposure (RME) scenarios for potential cancer risks and non-cancer risks. These conclusions are based on assumed exposures to soil in the filled ravine area (for residential receptors) and the filled ravine, upper bluff and Kreher Park area (for construction worker receptors), and to indoor air samples collected at NSPW Service Center. Carcinogenic risks based on central tendency evaluation (CTE) scenarios indicate that only the residential receptor exposure to soil (all soil depths to 10 feet bgs) are estimated to be at a CR of 1×10^{-4}, the upper-end of the EPA target risk range or greater than the WDNR threshold. Noncarcinogenic risks for the residential receptor (for soil depths 0-1 foot and 0-3 feet bgs) and risks associated with the construction scenario are within acceptable levels. However, residential receptor exposure to subsurface soil is not expected, given the current and potential future land use of the Site. For this Site, residential risks associated with exposures to surface soil (0 to 1 foot bgs) are within the target risk ranges.

Although the results of the HHRA indicate risks for the construction workers under the RME conditions exceed EPA's target risk levels, the assumptions used to estimate risks to this receptor were conservative and assumed the worst case. Given both the current and future land use of the Site, it is unlikely that construction workers would be exposed to soil in the filled ravine and Upper Bluff. The most likely scenario for the future construction worker is exposure to soil within 0 to 4 feet below ground surface (bgs) at Kreher Park (a typical depth for the installation of underground utility corridors), as most activities associated with the implementation of the future land use would be associated with regrading, landscaping, and road or parking lot construction. Therefore, risks to this receptor population are most likely overstated in the HHRA.

An HI of 3 was calculated for the general industrial worker exposure to indoor air pathway under the RME conditions. This risk level is likely to be an overestimate because:

- It was estimated using the maximum detected concentrations as the concentrations at points of exposure.
- It was calculated based on EPA default exposure parameters for the industrial /commercial workers (i.e., an individual works at the Site for 8 hours per day, 5 days per week, 50 weeks per year for a total of 25 years). The NSPW Service Center is used as a warehouse; there is an office space inside the building, but it is used only on a part-time basis.

Cancer risks to a subsistence fisher (finfish) are equivalent to the upper-end of the EPA target risk range, but greater than the WDNR threshold of a CR of 1×10^{-5}. Noncarcinogenic risk is within acceptable limits for both EPA and WDNR.

Risks to recreational children (surface soil) are equivalent to the WDNR risk threshold. However, risks to adolescent and adult receptors exposed to surface soil are below the EPA acceptable risk range and below the WDNR risk threshold.

Risks to waders and swimmers (sediments), industrial workers (surface soil), and maintenance workers (surface soil) are all within EPA's target risk range of 10^{-4} to 10^{-6} for lifetime cancer risk and a target HI of less than or equal to 1 for non-cancer risk, and are greater than the WDNR threshold of 1×10^{-5} for lifetime cancer risk and a target HI of less than or equal to 1 for non-cancer risk.

At the request of the Wisconsin Department of Health and Family Services, risks were also estimated for construction workers exposed to "oily materials" in groundwater via dermal contact and swimmers and waders who may be exposed to oil slicks in surface water via ingestion and dermal contact. Because no media-specific concentrations are available for either scenario, risks were estimated using analytical data collected from the product stream from the active NAPL recovery system for the Copper Falls aquifer or chemical-specific solubility values detected in the DNAPL sample. Risks to construction workers exposed to "oily material" in groundwater and adult swimmers and waders exposed to "oil slicks" in surface water is greater than both the EPA upper risk range (CR 1×10^{-4} and HI of 1) and WDNR threshold (CR 1×10^{-5} and HI of 1). However, it is important to note that there is much uncertainty associated with estimating risks to oily material in groundwater or oil slicks in surface water. The primary uncertainties are associated with the lack of an established methodology for estimating this exposure pathway.

Ecological Risk

The BERA concluded that the potential for adverse effects to ecological receptors other than benthic macroinvertebrates was not sufficient to result in significant adverse alterations to populations and communities of these ecological receptors. Unacceptable impacts to the benthic macroinvertebrate community in aquatic portions of the Site are possible. Two lines of evidence, bulk sediment chemistry and sediment toxicity testing, indicated that the probability of impairment at the community level was likely.

However, the fact that hydrocarbons are sporadically released as sheens from Site sediment during some high energy meteorological events or when disturbed indicates the potential for impact to the benthic community that may not have necessarily been fully measured by the studies conducted to support the RI. While there is no evidence that effects from these releases will lead to impairment of populations and communities of these receptors inhabiting the waters of Chequamegon Bay, the presence of this continuing source degrades the functioning of a healthy aquatic community in the Site area.

In addition, if normal lakefront activities (i.e., wading, boating etc.) were not presently prohibited, the disturbance of sediments and concomitant release of subsurface contaminants of potential concern (COPCs) would increase. This potentially could lead to greater impacts than were measured during these RI/FS studies.

7. Remedial Action Objectives (RAOs) and Remediation Goals

The specific goals of the remedial action are defined by acceptable contaminant levels, or a range of levels at each location for each exposure route. The acceptable contaminant level (or protectiveness) is determined based on the findings of the HHRA and the BERA. The general goal of RAOs is to protect human health and environmental receptors at risk due to unacceptable concentrations of COPCs at the site.

RAOs for Soil

RAOs are subject to the criteria evaluated in the FS. As described in the RAO Technical Memorandum (Appendix A to the RI), preliminary remedial action objectives for soil are as follows:

- Protect human health by reducing or eliminating exposure (ingestion/direct contact/inhalation) to soil having COPCs representing an excess cancer risk greater than 10^{-6} as a point of departure (with cumulative excess cancer risks not exceeding 10^{-5}) and a hazard index (HI) greater than 1 for reasonably anticipated future land use scenarios.

- Ensure future beneficial commercial/industrial use of the Site and recreational use of Kreher Park.
- Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with or incidental ingestion of soils or prey) to soil with levels of COPCs that would pose an unacceptable risk.
- Conduct NAPL removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land, sediments or water (groundwater and surface water).
- Protect the environment by minimizing/eliminating the migration of contaminants in the soil to groundwater, sediments or to surrounding surface water bodies.

RAOs for Groundwater

As described in the RAO Technical Memorandum, preliminary RAOs for groundwater are as follows:

- Protect human health by eliminating exposure (direct contact, ingestion, inhalation) to groundwater with COPCs in excess of regulatory or risk-based standards; reduce contaminant levels in groundwater to meet MCLs and State of Wisconsin Drinking Water Standards
- Protect the environment by controlling the off-site migration of contaminants in groundwater to surrounding surface water bodies which would result in exceedance of ARARs for COPCs in surrounding surface waters.
- Conduct NAPL removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water.

No COPCs were initially identified in the HHRA for groundwater because groundwater is not used as a potable water supply. However, currently there is no restriction on groundwater use in the area of known contamination. Exposure to contaminated groundwater and accompanying NAPLs can potentially occur via the following exposure scenarios:

- Construction worker exposure to shallow groundwater infiltrating trenches at Kreher Park; and
- Trespasser exposure to groundwater infiltrating the lower level of the former WWTP.

NAPL encountered in the Kreher Park fill, ravine fill, NSPW property and Copper Falls aquifer are a source for the dissolved phase plumes identified in groundwater in each unit at the Site. RAOs for NAPL within these units are based on ch. NR 708.13, Wisconsin Administrative Code (WAC), which states the following:

> *Responsible parties shall conduct free product removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, lands or waters of the state. When required, free product removal shall be conducted, to the maximum extent practicable, in compliance with all of the following requirements:*
>
> - *Free product removal shall be conducted in a manner that minimizes the spread of contamination into previously uncontaminated zones using recovery and disposal techniques appropriate to the hydrologic conditions at the site or facility, and properly reuses or treats discharges of recovery byproducts in compliance with applicable state and federal laws.*
> - *Free product removal systems shall be designed to abate free product migration.*
> - *Any flammable products shall be handled in a safe and competent manner to prevent fires or explosions*

RAOs for Sediment

As described in the RAO Technical Memorandum, in general, the goals of remedial action for sediment are to prevent human ingestion or direct contact with sediments having COPCs which pose an unacceptable risk to human health. Similarly, for ecological receptors, the general goal is to prevent direct contact with or ingestion of sediments or of prey having levels of COPCs that would pose an unacceptable risk to populations of ecological receptors or individuals of protected species.

Remedial action objectives for sediment include:

- Protect human health by eliminating exposure (direct contact, ingestion, inhalation, fish ingestion) to sediment with COPCs in excess of regulatory or risk-based standards;
- Conduct NAPL removal whenever it is necessary to halt or contain the discharge of a hazardous substance or to minimize the harmful effects of the discharge to the air, land or water; and
- Protect populations of ecological receptors or individuals of protected species by eliminating exposure (direct contact with sediment or ingestion of sediment or prey) to sediment with COPCs that would pose an unacceptable risk.

With the exception of iron, the cumulative risks estimated for the human health recreational receptor exposures to sediments were below EPA's target risk levels.

For ecological receptors, EPA set the sediment PRG at 2295 μg PAHs/g OC or 9.5 ug PAH/g dry weight (dwt) at 0.415% OC. In addition, EPA directed that, "if the final depth of sediments will be less than 6 feet, the PRG for any active remedial intervention will be adjusted downward as based upon ultraviolet light (UV) extinction coefficients measured in Site waters. In addition, sediments in greater than 6 feet of water having a concentration equal or less than 2,295 ug PAH/g OC (9.5 ug PAH/g dwt at 0.415% OC) and sediments in 6 feet or less of water having a concentration greater than a UV-adjusted PRG will be monitored to assure that there are no unacceptable impacts to benthic community and that the levels of PAHs in surface sediments decrease over time to 1,340 ug PAH/g OC (5.6 ug PAH/g dwt at 0.415% OC)."

8. Description of Alternatives

At the FS stage there remain following screening a large number of potential remedial alternatives depending upon the media and the Site area. Potential remedial responses were reviewed for soil, groundwater, and sediment. The filled ravine and Kreher Park include remedial alternatives for both soil and groundwater. Remedial alternatives for the Copper Falls aquifer are limited to groundwater, and remedial alternatives for the offshore sediments are limited to sediment. Table 1 (presented in Section 4, above) includes a summary of potential remedial alternatives for each area of concern consisting of the following:

- At the upper bluff area, 14 alternatives for remediating the "filled ravine";
- At the upper bluff area, 7 alternatives for remediating "Copper Falls aquifer";
- At the lakefront, 12 alternatives for remediating soil and groundwater; and
- In the lake, 16 alternatives for remediating offshore sediments.

Because it was impractical to attempt to illustrate every permutation of concurrent or sequential implementation of these various remedial alternatives, through discussions with EPA and WDNR, ten remedial scenarios that illustrate how a range of representative response actions and remedial technologies and processes could be integrated are summarized in Table 2 (presented in Section 4, above).

Remedial responses implemented at each area may require forms and combinations of containment, removal and in-situ treatment. This will result in the generation of solid waste (soil and sediment) and wastewater (from sediment de-watering, excavation de-watering, and long-term groundwater extraction). Significant resources will be committed to the management of these wastes. Cost estimates for the remedial responses evaluated include waste management, but volumes treated or generated will vary among remedial responses. The optimum remedial program for the entire Site may require the utilization of different remedial technologies at each area of concern. The following sections describe suggested remedial scenarios that group these alternatives at each affected area. Elements that will be addressed for each scenario include the following:

1) How different areas of the Site will be used for different activities;
2) Whether there is logic for implementing certain response actions at certain areas of the Site prior to others to prevent cross-contamination;

3) Effectively applying ancillary technologies (i.e. dewatering, wastewater treatment, transportation, and disposal) to address more than one medium; and
4) Potential for cost savings from this optimization.

Based on cost estimates presented in this FS, each remedial scenario includes a range of estimated costs for each area of concern. The sum of cost estimates for each area of concern was used to derive a range of costs for remediation at the entire Site. These cost estimates provide useful information to evaluate combinations of potential remedial technologies. However, a more accurate cost estimate of cost savings will not be known until design phase cost estimates are prepared.

9. Comparative Analysis of Alternatives

A brief summary of the comparative analysis for each media of the ten alternatives under the nine criteria follows:

Protection of Human Health and the Environment

Soil

Alternative S-1 (no action) offers no protection of human health and the environment because no actions would be taken to address soil contamination at the Site. ***Alternative S-3B*** (unlimited removal and off-site disposal) offers the highest level of protection of human health and the environment in the long term because all fill and contaminated soil would be removed. ***Alternative S-3A*** (limited removal and off-site disposal), ***Alternative S-5A*** (limited removal and on-site thermal treatment), and ***Alternative S-5B*** (limited removal and incineration) would also offer high levels of protection because these remedial responses would result in the removal of a significant contaminant mass. ***Alternative S-6*** (limited removal and treatment by soil washing) would offer a moderate to high level of overall protection if this technology can be implemented to effectively reduce contaminant concentrations. ***Alternative S-2*** (containment using engineered surface barriers) will eliminate the direct contact exposure route, but will provide a low level of overall protection because soil contamination will remain. ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) will provide a moderate level of protection of human health and the environment because highly contaminated material from the upper bluff area and the former coal tar dump area will be consolidated into a disposal cell at Kreher Park.

Although unlimited removal for ***Alternative S-3B*** (unlimited removal and off-site disposal) will provide a high level of human health and environmental protection, limited removal for Alternatives S-3A, S-5A, S-5B, and S-6 will also provide adequate protection because these remedial responses will result in the removal of a significant mass of contamination. Although Alternatives S-2 and S-4 will result in the containment of contaminated materials, making them inaccessible to humans or biota and thereby reducing risk, the overall level of protection is lower because there is no reduction of contaminant mass.

Groundwater

Alternative GW-1 (no action) offers no protection of human health and the environment because no actions would be taken to address groundwater contamination at the Site. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using permeable reactive barriers (PRB) walls offer an overall moderate level of protection because contaminants will be left on site. These materials will be contained and inaccessible to humans or biota, thereby reducing risk, but offer no protection for the underlying Copper Falls aquifer. ***Alternative GW-9*** (removal using groundwater extraction wells) can be used for shallow and deep groundwater, but offers a moderate level of protection of human health and the environment in the long term because operation will require an extended period to achieve RAOs. The remaining alternatives offer high levels of protection because each technology will result in the removal of a significant contaminant mass, NAPL in particular, from the subsurface.

Sediment

Alternative SED-1 – No Action – offers the least protection of human health and the environment, as no actions would be taken to address site issues.

Alternative SED-2 – CDF – assures protection of human health and the environment by eliminating access to impacted sediment. Under this alternative, there is no destruction of COPCs, but these materials are permanently contained and inaccessible to humans or biota, thereby reducing risk.

Alternative SED-3 – subaqueous capping of a portion of the sediment and removal of the remainder – is also protective of human health and the environment, because it isolates a portion of the sediment above the sediment PRG from exposure to humans or biota. The remaining sediment above the sediment PRG is removed. If that portion is thermally treated it reduces its volume and permanently eliminates its toxicity by treatment. If the sediment were to be sent for disposal without treatment, then this alternative reduces in situ volume and eliminates exposure to humans and biota by transfer of these materials to an environment where access is controlled. There is no reduction in toxicity if the sediment that is removed is disposed in a landfill, although because access would be controlled there would be no exposure to humans or ecological receptors.

Alternative SED-4 – dredging – is protective of human health and the environment if the sediment is treated or disposed off-site, because it results in decontamination and/or removal of sediment above the PRG and removes it from the aquatic environment. Reduction of toxicity would vary depending on whether the removed sediments are treated or not.

Alternative SED-5 – dry excavation – is protective of human health and the environment if the sediment is treated or disposed off-site, because it results in decontamination and/or removal of sediment above the PRG and removes it from the aquatic environment. Reduction of toxicity would vary depending on whether the removed sediments are treated or not.

Alternative SED-6- combination dry excavation and dredging - is protective of human health and the environment if the sediment is treated or disposed off-site, because it results in decontamination and/or removal of sediment above the PRG and removes it from the aquatic environment. Reduction of toxicity would vary depending on whether the removed sediments are treated or not.

Since the project duration is anticipated to be a number of years the potential for volatilization of VOCs and exposure to residents is greater. In addition, it would preclude the use of Kreher Park for the project duration.

Compliance with ARARs

Soil

Alternative S-1 (no action) will not achieve compliance with ARARs and TBCs. ***Alternatives S-2, S-4A,*** and ***S-4B*** (surface barriers, and limited and unlimited removal and on-site disposal) must be implemented with a groundwater remedial response to achieve compliance. If properly implemented, the remaining remedial responses could achieve compliance with ARARs and TBCs for soil.

Groundwater

Alternative GW-1 (no action) will not achieve compliance with ARARs and TBCs. Compliance with ARARs and TBCs could be achieved for the remaining remedial alternatives for groundwater. Implementation will require that engineering and construction actions be developed and completed in compliance with federal and state regulations.

Sediment

Alternative SED-1 (no action) would not comply with regulations. **Alternatives SED-2** (CDF) and **SED-3** (partial dredge and subaqueous cap) would not comply with the ARARs including Section 30.12, Wis. Statutes which allows for the placement of a structure or deposit on the bed of navigable waters with a Department permit. A deposit of sand, gravel, or stone that totals less than 2 cubic yards and is associated with other structures is exempt from permit requirements. The placement of a structure or deposit must not be detrimental to the public interest, must not materially reduce the flood flow capacity of a stream, and must not materially obstruct navigation. A cap or confined disposal facility on the bed of Lake Superior clearly does not meet these requirements for approval and cannot be permitted by the Department under Section 30.12, Wis

Statutes. A bulkhead line may be established under Section 30.11, Wis. Statutes, however that bulkhead line must be in the public interest and shall conform as nearly as practicable to the existing shoreline. The proposed confined disposal facility under SED-2 would not follow the shoreline and would not meet the public interest standards and therefore cannot be established using this statutory authority.

Alternatives, SED-4, SED-5 and SED-6 (dredging, dry excavation, and combination dry excavation and dredging, respectively) would be similar with respect to meeting ARARs and TBCs, as engineering and construction actions would be developed and completed in compliance with federal and state regulations.

<u>Permanence</u>

Soil

Alternative S-1 (no action) will not provide any long-term benefit; no additional actions will be taken to address soil contamination at the Site. ***Alternative S-3B*** (unlimited removal and off-site disposal) will provide the highest effectiveness and permanence over the long term because all contaminated material and fill soil would be removed. ***Alternative S-3A*** (limited removal and off-site disposal), ***Alternative S-5A*** (limited removal and ex-situ thermal treatment), and ***Alternative S-5B*** (limited removal and incineration) will also be highly effective and permanent over the long term because these responses will result in the removal of a significant mass of contamination. ***Alternative S-6*** (limited removal and treatment by soil washing) will provide moderate to high levels of effectiveness and permanence over the long term; effectiveness will depend upon the reduction in contaminant concentrations that can be achieved with this technology which cannot be determined without a treatability study. The long-term effectiveness of ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) is considered low to moderate because contaminants will remain on site in a disposal cell constructed at Kreher Park. The long-term effectiveness of ***Alternative S-2*** (containment using engineered surface barriers) is considered low because constituents will remain at the site beneath the surface barriers. However, for ***Alternatives S-2***, ***S-4A***, and ***S-4B***, contaminated material will be contained and inaccessible to humans or biota, thereby reducing risk.

If properly implemented, the long-term effectiveness and permanence for all alternatives (except Alternative S-1) can be achieved for all active remedial responses for soil. Surface barriers (Alternative S-2) must be implemented in conjunction with a remedial response for groundwater to be more effective.

Groundwater

Alternative GW-1 (no action) will not provide any long-term benefit; no actions will be taken to address groundwater contamination at the Site. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using PRB walls) offer low levels of effectiveness and permanence over the long term. Although risk will be reduced by containment of contaminated material, contaminants will be left on site. Additionally, both are limited to shallow groundwater; neither is a feasible alternative for the underlying Copper Falls aquifer. ***Alternative GW-9*** (removal using groundwater extraction wells) will provide a moderate level of effectiveness and permanence over the long term; operation will be required for an extended period to achieve RAOs. The remaining alternatives have high levels of effectiveness and permanence over the long term because each technology will result in the removal of a significant contaminant mass, NAPL in particular, from the subsurface.

Sediment

Alternative SED-1 (no action) would not provide any long-term benefit, as any potential risk associated with impacted sediment is not addressed through remedial action.

Although there is no reduction in volume or toxicity of the contaminated sediment, **Alternative SED-2** (CDF) still provides a moderate level of permanence and effectiveness over the long term. Since no sediment is treated, the toxicity of the material remains the same, however accessibility and exposure to humans and biota is eliminated through containment.

Alternative SED-3 (partial dredge and subaqueous cap) provides a high level of long term effectiveness and permanence for the sediment that is removed and treated. For the contaminated sediment that is capped there is no destruction of COPCs, but these materials are permanently contained and inaccessible to humans or biota, thereby reducing risk. A volume of approximately 78,000 cubic yards would be permanently removed from the environment. If the sediment that is removed is not treated but disposed in an NR500 landfill exposure to humans and biota is eliminated through access restrictions.

Alternatives SED-4, SED-5 and SED-6 (dredging, dry excavation, and combination dry excavation and dredging, respectively) would provide the highest effectiveness and permanence over the long term due to the permanent removal of the largest volume of sediment. If treated, thermal treatment of the sediment would eliminate toxicity, reduce volume and is permanent. If the sediment that is removed is not treated but disposed in an NR500 landfill, exposure to humans and biota is eliminated through access restrictions.

Reduction of Toxicity, Mobility or Volume through Treatment

Soil

Alternative S-1 (no action) will not result in a reduction in the toxicity, mobility, or volume of contaminated soil. ***Alternative S-3B*** (unlimited removal and off-site disposal) will result in the highest degree of reduction of toxicity, mobility, and volume of impacted material because all contaminated soil and fill material will be removed. ***Alternative S-3A*** (limited removal and off-site disposal), ***Alternative S-5A*** (limited removal and ex-situ thermal treatment), and ***Alternative S-5B*** (limited removal and incineration) will also result in a high degree of reduction of toxicity, mobility, and volume of impacted material because these remedial responses will remove a significant contaminant mass. ***Alternative S-6*** (limited removal and treatment by soil washing) will result in a moderate to high degree of reduction of toxicity, mobility, and volume of contaminated soil, but will depend upon the reduction in contaminant concentrations that can be achieved with this technology. ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) will offer a low to moderate reduction in the toxicity, mobility, and volume of contaminated soil at the Site. It will effectively reduce the toxicity and a significant volume of contaminated soil at the upper bluff area and former coal tar dump area, but this material will be placed in a disposal cell at Kreher Park; which although this reduces the mobility of contaminants, it does not reduce the volume or toxicity at Kreher Park ***Alternative S-2*** (containment using engineered surface barriers) will not reduce the toxicity or and volume of contaminated soil in unexcavated areas, but it will limit the mobility of contaminants by reducing infiltration, which will minimize contaminant leaching to groundwater.

Groundwater

Alternative GW-1 (no action) will not result in a reduction in the toxicity, mobility, or volume of contaminated groundwater. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using PRB walls) will not result in a reduction in the toxicity or volume of contaminant mass. However, both will reduce contaminant mobility for shallow groundwater, but not for the Copper Falls aquifer. ***Alternative GW-9*** (removal using groundwater extraction wells) will result in a reduction in the toxicity, mobility, and volume of contaminant mass, but operation will be required for an extended period to achieve RAOs. Implementation of the remaining in-situ treatment alternatives will result in the highest degree of reduction of toxicity, mobility, and volume of impacted groundwater. However, the amount of volume reduction will vary for each of the remaining in-situ treatment alternatives.

Sediment

Alternative SED-1 (no action) offers no reduction in toxicity, mobility, or volume through treatment, as no action is taken.

Alternative SED-2 (CDF) would permanently reduce the mobility of contaminated sediments, although the toxicity and volume would not change. While there is no destruction of COPCs, these materials are permanently contained and inaccessible to humans or biota, thereby reducing risk.

Alternative SED-3 (partial dredge and subaqueous cap) would reduce toxicity, mobility and volume of approximately 78,000 cubic yards of sediment which would be permanently removed from the environment. That sediment remaining under the cap would have permanently reduced mobility, and since it would be inaccessible to humans or biota it would eliminate exposure and risk. The inherent toxicity of the sediment remaining under the cap would not be reduced.

Alternatives SED-4, SED-5 and SED-6 (dredging, dry excavation, and combination dry excavation and dredging, respectively) would have the greatest degree of reduction of toxicity, mobility, and volume of impacted material. Mobility would be reduced by permanently containing it in an NR500 landfill. Likewise, toxicity would be reduced since exposure to humans and biota would be eliminated because access in an NR500 landfill is controlled.

Short-term Effectiveness

Soil

Implementation of ***Alternative S-1*** (no action) will not achieve RAOs or improve environmental impacts in the short term. Because there is no remediation, there will be no exposure to the community and workers. The remaining alternatives will improve environmental impacts in the short term, but require significant effort to protect the community and workers during remediation. Implementation of ***Alternative S-3B*** (unlimited removal and off-site disposal) will result in the most significant on- and off-site disturbance and require the highest levels of effort for this protection. ***Alternatives S-4A*** and ***S-4B*** (limited removal and on-site disposal) will result in no off-site disturbance; all disturbance will be limited to the site, and will require a moderate level of effort for protection. ***Alternative S-2*** (containment using engineered surface barriers) will result in minimal on-site disturbance, and no off-site disturbance. Because the remaining alternatives include limited removal of highly contaminated soil, they will require high levels of effort for worker and community protection. If properly implemented, all alternatives, can achieve short-term effectiveness for soil. Surface barriers (***Alternative S-2***) must be implemented in conjunction with a remedial response for groundwater to be more effective.

Groundwater

Implementation of ***Alternative GW-1*** (no action) will not achieve RAOs or improve environmental impacts in the short term, but also will not pose any implementation risks to the community and workers, as no remedy would be implemented. The short-term effectiveness for the remaining alternatives is considered high. Each alternative can achieve RAOs and will reduce environmental impacts in the short term by removing contaminant mass or preventing the off-site migration of contaminants. Containment, in-situ, and removal technologies evaluated in this report will require minimal effort to protect the community and workers during remediation.

Sediment

Alternative SED-1 (no action) would have the least short-term impact on human health and the environment, as impacted sediment would not be disturbed, so there would be no potential for releasing COPCs into surface water and air. Of the three active remedial options, **Alternative SED-2** (CDF) would have the least short-term impact, as sediment is not brought to shore for dewatering or treatment, but is disposed in a CDF, a portion of which is subaqueous. Adequate controls would be in place to ensure worker and community safety during remedial activities. All other alternatives would have the potential of some short-term risk from release of volatile emissions during debris removal and onshore dewatering and/or treatment. Release of volatile emissions from land-based activities including filling of a CDF could be better controlled than for dredging activities.

Implementability

Soil

Alternative S-1 (no action) has no construction or operation requirements, so has no technical implementability issues. From an administrative standpoint, however, there would be significant issues since the City and WDNR would be resistant to selection of such an alternative. ***Alternative S-3B*** (unlimited removal and off-site disposal) will result in significant site disturbance, and will be the most difficult to implement. ***Alternative S-6*** (limited removal and treatment by soil washing) may require a pilot test to evaluate its implementability. The remaining limited removal alternatives are highly implementable.

Groundwater

Alternative GW-1 (no action) has no construction or operation requirements, so has no technical implementability issues; it would have the administrative issues mentioned above, however. ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using PRB walls) have a very high degree of implementability. The remaining alternatives also have a high degree of implementability. However, buried structures in the upper bluff area and the wood waste layer at Kreher Park may limit the effectiveness of in-situ treatment for shallow and deep groundwater in these areas. Removal of the buried structures concurrent with remedial alternatives evaluated for soil may ease implementation of the in-situ treatment and removal alternatives for the Copper Falls aquifer. If removal and disposal (on- or off-site) or on-site treatment is selected as a remedial response for soil, or if containment is selected for shallow groundwater, in-situ treatment and or removal will not be necessary for soil and shallow groundwater contamination, but one or more of the in-situ or removal technologies evaluated in this report will be required for the Copper Falls aquifer.

Sediment

Implementation of **Alternative SED-1** (no action) would be easy, as no action would be performed. The administrative issues mentioned above, however, would apply.

Alternative SED-2 (CDF) would be more difficult to implement than Alternative SED-1. The technology and equipment that would be used for this alternative is readily available, and has proven to be reliable at other similar sites. However, because WDNR has indicated that the Governor and Legislature must approve Alternatives SED-2 and SED-3, obtaining authorization to proceed may be problematic. Long-term monitoring, included as a part of Alternatives SED-2, SED-3, and SED-4, would allow periodic evaluation of risks associated with materials left in place.

Alternatives SED-3 and SED-4 (partial dredge and subaqueous cap and dredge all, respectively) would be still more difficult to implement, as additional equipment, technology, and permitting would be required to perform the dewatering, thermal treatment, and disposal of sediment as well as for implementation of engineering controls for volatilization. Furthermore, the capping component included as part of Alternative SED-3 would add additional complexity to the implementation of this alternative.

Alternative SED-5 and SED-6 (dredging, dry excavation, and combination dry excavation and dredging, respectively) might be more difficult to implement because of the need to install safe and watertight enclosures that would have to be maintained for the project duration.

Cost

Soil

There are no costs associated with ***Alternative S-1*** (no action) because no remedial action will be implemented. For the upper bluff area, the ***Alternatives S-3B*** (unlimited removal and off-site disposal) and ***Alternative S-5B*** (limited removal and incineration) yielded the highest costs. ***Alternative S-6*** (limited removal and treatment by soil washing) yielded the next highest cost, following by ***Alternative S-5A*** (unlimited removal and on-site thermal treatment) and ***Alternative S-3A*** (limited removal and off-site disposal). ***Alternatives S-4A*** and ***S-4B*** (limited and unlimited removal and on-site disposal) yielded lower costs for the upper bluff area. ***Alternative S-2*** (containment using engineered surface barriers) would be the lowest cost remedial response for soil in the upper bluff area, but would likely need to be completed in conjunction with a groundwater remedial response to be effective.

Alternative S-3B (unlimited removal and off-site disposal) also yielded the highest cost for Kreher Park. ***Alternative S-4B*** (unlimited removal and on-site disposal at Kreher Park) yielded the next highest cost followed by ***Alternative S-6*** (limited removal and treatment by soil washing), ***Alternative S-5A*** (limited removal and on-site thermal treatment), ***Alternative S-2*** (containment using engineered surface barriers) ***Alternative S-5B*** (limited removal and off-site incineration), and ***Alternative S-4A*** (limited removal and on-site disposal). ***Alternative S-3A*** (limited removal and off-site disposal) yielded the lowest cost.

Groundwater

There are no costs associated with ***Alternative GW-1*** (no action) because no remedial action will be implemented. For shallow groundwater, ***Alternatives GW-2*** and ***GW-5*** (containment using surface and vertical barriers and in-situ treatment using PRB walls) have high installation costs. Annual O&M cost for ***Alternative GW-2*** are high due to long term groundwater recovery and disposal costs, but low for ***Alternative GW-5***, which relies on in-situ treatment. Costs for implementation of the in-situ treatment ***Alternatives GW-6*** (chemical oxidation), ***GW-7*** *(electrical resistance heating* (ERH)), and ***GW-8*** (steam injection) area also high with low annual O&M costs. ***Alternative GW-3*** (ozone sparging) has low implementation and annual O&M costs. Implementation costs for ***Alternative GW-9*** are the lowest, but this remedy has high annual O&M cost for continued operation, which may be required for an extended period of time.

For the Copper Falls aquifer, in-situ treatment ***Alternatives GW-6*** (chemical oxidation), ***GW-7*** (ERH), and ***GW-8*** (steam injection) have high implementation costs. ***Alternative GW-6*** has high O&M cost, and ***Alternatives GW-7*** and ***GW-8*** have low O&M annual costs. In-situ treatment ***Alternatives GW-3*** (ozone sparging), and ***GW-4*** (surfactant injection) have low implementation costs, but high annual O&M costs. As with shallow groundwater, implementation costs for ***Alternatives GW-9*** are the lowest, but this alternative has high annual O&M cost for continued operation, which may be required for an extended period of time.

Sediments

There would be no costs associated with **Alternative SED-1** (no action) because no remedial action will be implemented. The cost for **Alternative SED-2** (CDF) would be greater than the cost for **Alternative SED-3** (partial dredge and subaqueous cap) if construction of the CDF is required to meet ch. NR 504, WAC specifications and armoring to the top of the sheet pile is required on the lakeside. The cost for implementation of **Alternative SED-4** (dredge all) would range between approximately $41 to $61 million depending upon whether the sediment is mechanically or hydraulically dredged and whether it is thermally treated. Cost for implementation of **Alternatives SED-5 and SED-6** would range between approximately $63 to $82 million depending upon whether the sediment is thermally treated.

State Acceptance

To be determined.

Community Acceptance

To be determined.

10. Principal Threat Waste

There is principal threat waste at the Ashland/NSP Lakefront site. The PAH-impacted soil, groundwater and sediment are considered to impart a long-term threat to human health and the environment. There is notable free product in all media on the site.

11. Preferred Alternative

The Region prefers that **Remedial Scenario X** be implemented. The estimated cost is approximately $83.5 to $96.5 million. Major components of this remedial scenario include:

- **Sediments:** Alternative SED-6B – Using shore based excavation equipment, remove in the dry all nearshore sediment and wood debris that exceeds 9.5 ppm total PAHs. In addition, remove wood debris from offshore sediments and mechanically or hydraulically dredge remaining offshore sediments that exceed 9.5 ppm total PAHs. After dredging is completed, place six inches of clean fill/fish mix on dredged areas. Dewater and stabilize sediments at Kreher Park area and treat wastewater; discharge treated wastewater to lake. Transport stabilized sediments off site to NR 500 permitted landfill or thermal treatment. Dispose of or burn wood debris separately.
- **Kreher Park:** Alternative S-5A - Limited soil removal with ex-situ thermal treatment. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediments will be the alternate remedy, and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps at Kreher Park to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Filled Ravine:** Alternative S-5A - Limited soil removal with ex-situ thermal treatment. If thermal treatment is determined to be more difficult and not cost effective, then off-site disposal of sediments will be the alternate remedy, and containment using engineered surface and vertical barriers with groundwater extraction as hydraulic control (Alternative GW-2A). Alternative GW-2A includes caps to limit groundwater recharge. Shallow groundwater extracted from the contained area for hydraulic control would be treated onsite and discharged to the lake or POTW. In-situ chemical oxidation (GW-6) can also be used to possibly enhance groundwater treatment.
- **Copper Falls Aquifer:** Enhance existing groundwater extraction system (GW-9B). In-situ chemical oxidation (GW-6) or in-situ treatment via ozone sparge (GW-3) can be used to possibly enhance groundwater treatment.

- **<u>Conduct O&M and Long-Term Monitoring:</u>** Collect groundwater samples to ensure contaminants are not migrating off site or from the contained area with groundwater. Fluid levels within the contained area will also need to be monitored to ensure that groundwater remains at or below the design elevation. Complete annual inspections to ensure integrity of surface barriers and repair damage as needed. Conduct MNR monitoring of sediments.
- **<u>Institutional controls:</u>** Implement groundwater use and deed restriction as part of remedial response at upper bluff and Kreher Park where contaminants remain in subsurface. Groundwater use restrictions for shallow groundwater in contained areas will also be required.

12. ARARs

A list of ARARs is attached as Appendix A.

13. Technical & Policy Issues

Pre-design studies will be likely for the dry dredging and offshore dredging to help determine what kind of dredging will work best.

14. Cost Information

A cost breakdown for Remedial Scenario X is provided in Table 3. A detailed cost estimate is also included as an attachment.

EPA requested that the PRP update the costs for Alternative SED-4 (dredge all) in the revised FS Report. EPA anticipates receiving the updated FS Report on October 24, 2008, so updated cost estimates for Alternative SED-4 were not available as of the writing of this package. EPA believes that the cost differential between the SED-4 alternative and the SED-6 alternative (combination dry excavation and dredging, included in the preferred alternative above) is significantly less than was estimated in the draft FS Report. The difference between Alternatives SED-4 and SED-6 in the original FS Report was approximately $22 million (with SED-6 costing more). EPA believes, based on its review of the costs and underlying assumptions, that the difference is approximately $10 million.

15. Letters from Stakeholders and State

See attachments.

16. Figures

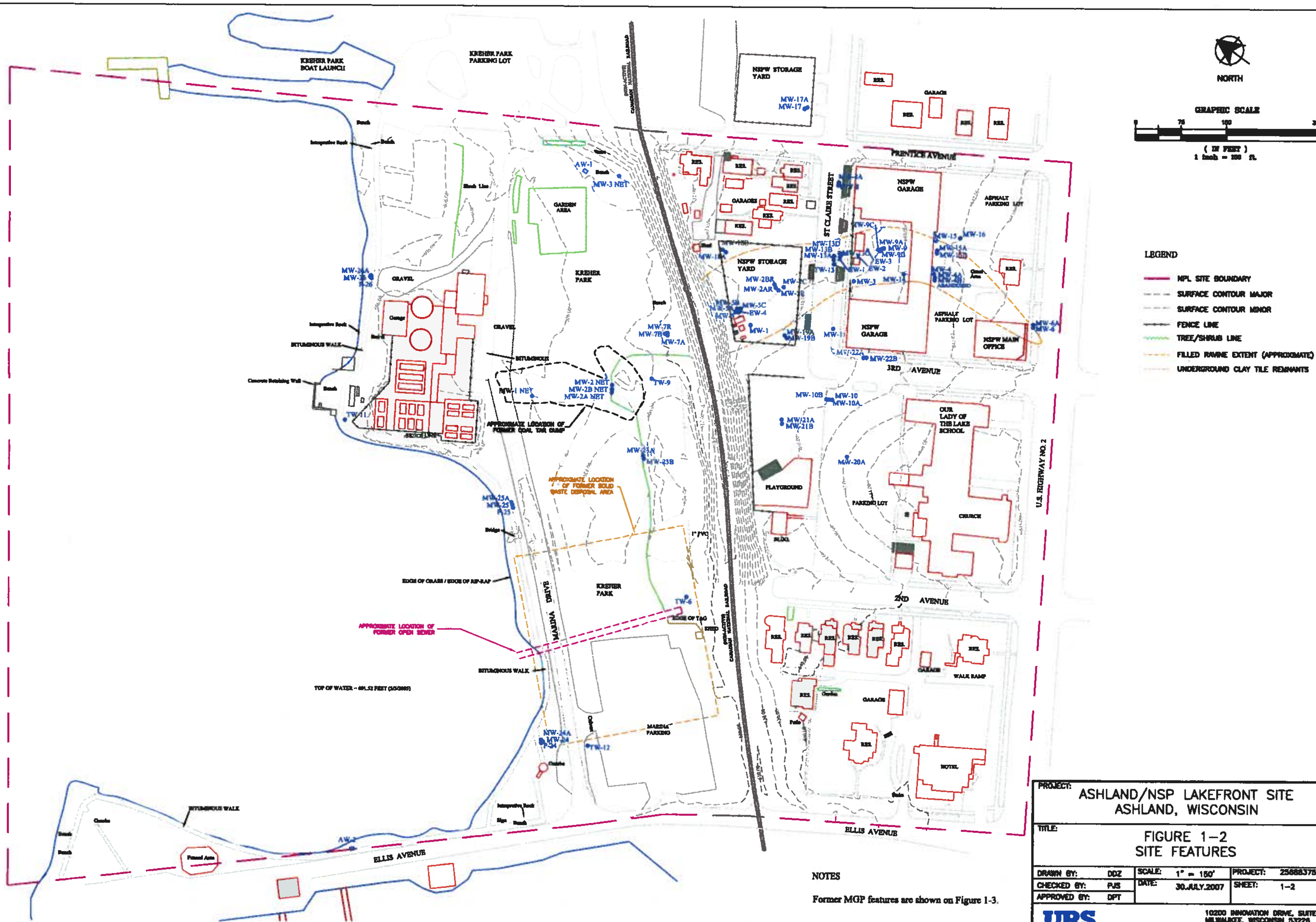
See attachments.

Table 3 - Cost Summary for Remedial Scenario X

Area of Concern	Remedial Response	Capital Costs	OM & M	Total
Offshore Sediment	**SED-6B** - Hybrid Remedy: Dry Excavation Nearshore/Dredging Offshore with onsite ex-situ thermal desorption	$70,329,000	$715,000	$71,045,000
Kreher Park	**S-3A** - Limited removal/offsite disposal or	$1,509,000	$0	$1,509,000
	S-5A - Limited removal/onsite ex-situ thermal desorption or	$2,158,000	$0	$2,158,000
	S-5B - Limited removal/offsite incineration or	$3,777,000	$0	$3,777,000
	S-6 - Limited removal/ex-situ soil washing	$2,653,000	$0	$2,653,000
	AND			
	GW-2A - Engineered surface and vertical barriers with hydraulic control or [1]	$4,797,000	$2,505,000	$7,302,000
	GW-5 - Engineered surface and vertical barriers with PRB Wall[1]	$5,658,000	$397,000	$6,055,000
Filled Ravine	**S-3A** - Limited removal/offsite disposal or	$3,415, 000	$0	$3,415, 000
	S-5A - Limited removal/onsite ex-situ thermal desorption or	$4,706,000	$0	$4,706,000
	S-5B - Limited removal/offsite incineration or	$8,103,000	$0	$8,103,000
	S-6 - Limited removal/ex-situ soil washing	$5,961,000	$0	$5,961,000
	AND			
	GW-2A - Engineered surface and vertical barriers with hydraulic control (at Kreher Park)[1] or	Capital costs for surface barriers are included with alternatives S-3A, S-5A, S-5B, and S-6 above, and OM&M costs are included with OM&M costs for Kreher Park.		
	GW-5 - Engineered surface and vertical barriers with PRB Wall (at Kreher Park)[1]			
Copper Falls Aquifer	**GW-3** - Ozone sparge or	$1,182,000	$695,000	$1,877,000
	GW-4 - Surfactant injection and dual phase recovery and	$744,000	$682,000	$1,426,000
	GW-9A - Existing groundwater extraction system	Costs are included with alternatives GW-3 and GW-4 above.		
	OR			
	GW-6 - In-situ Chemical Oxidation or	$3,128,000	$2,596,000	$5,724,000
	GW-7 - Electrical Resistance Heating or	$6,880,000	$123,000	$7,003,000
	GW-8 - Steam Injection or	$7,188,000	$123,000	$7,311,000
	GW-9B - Enhanced Groundwater Extraction System	$411,000	$5,979,000	$6,420,000
Total Estimated	Offshore Sediments	$70.4M	0.7M	$71.1M
	Kreher Park	$7.2 to $7.9 M	$0.4 to $2.5 M	$7.6 to $10 M

Area of Concern	Remedial Response	Capital Costs	OM & M	Total
Cost	Filled Ravine	$3.4 to $8.1 M	$0	$3.4 to $8.1 M
	Copper Falls Aquifer	$0.4 to $7.2 M	$0.13 to $5.9 M	$1.4 to $7.3 M
	Total Estimated Cost	$81.4 to $93.6M	$1.3 to $9.1 M	$83.5 to 96.5M

Figures



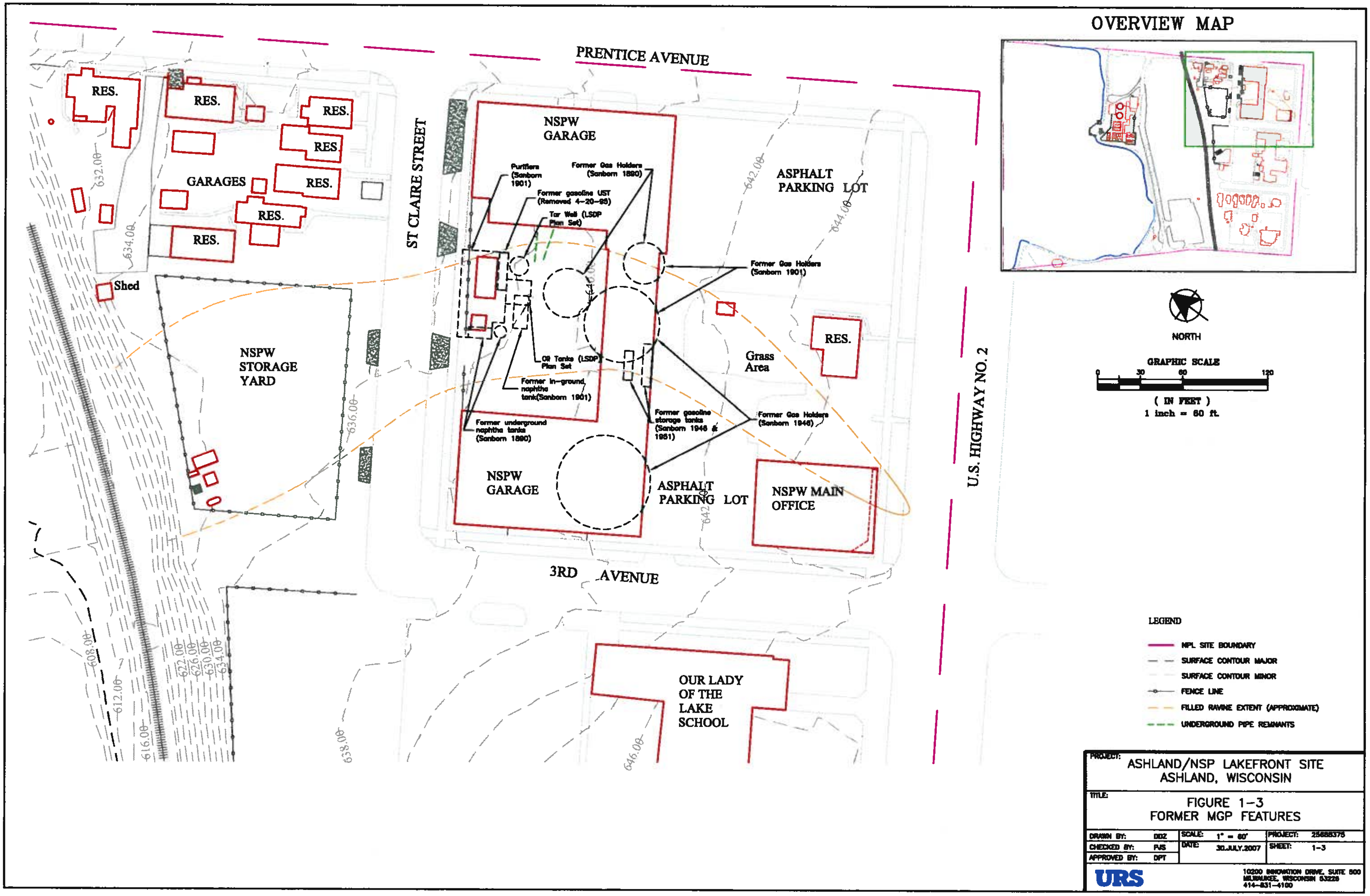
NOTES

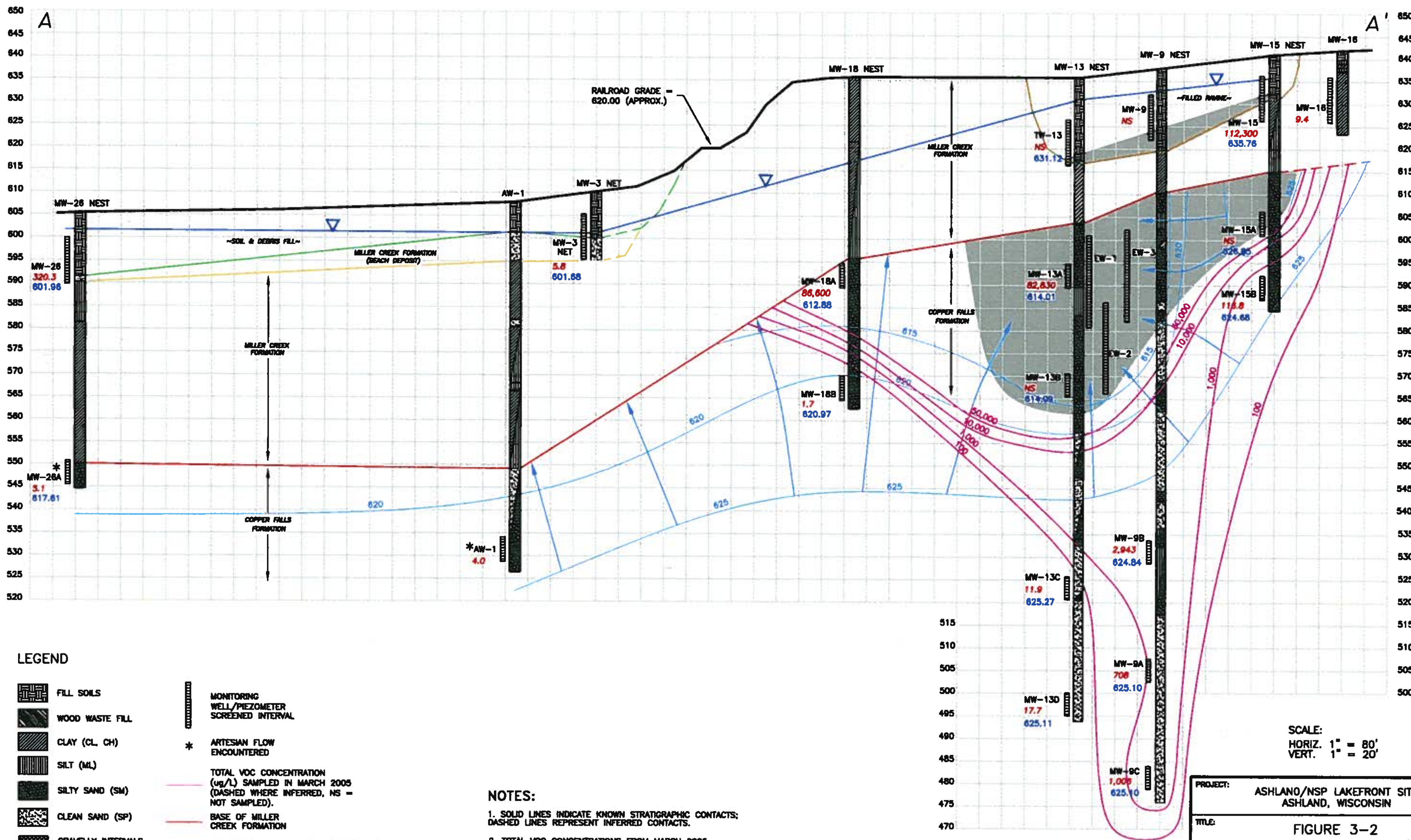
Former MGP features are shown on Figure 1-3.

PROJECT:	ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN				
TITLE:	FIGURE 1–2 SITE FEATURES				
DRAWN BY:	DDZ	SCALE:	1" = 150'	PROJECT:	25688375
CHECKED BY:	PJS	DATE:	30.JULY.2007	SHEET:	1-2
APPROVED BY:	DPT				

URS

10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100


OVERVIEW MAP
PRENTICE AVENUE
ST CLAIRE STREET
3RD AVENUE
U.S. HIGHWAY NO. 2
RES.
RES.
RES.
RES.
RES.
RES.
RES.
GARAGES
Shed
NSPW STORAGE YARD
NSPW GARAGE
NSPW GARAGE
Purifiers (Sanborn 1901)
Former Gas Holders (Sanborn 1890)
Former gasoline UST (Removed 4-20-95)
Tar Well (LSDP Plan Set)
Oil Tanks (LSDP Plan Set)
Former in-ground naphtha tank(Sanborn 1901)
Former underground naphtha tanks (Sanborn 1890)
Former Gas Holders (Sanborn 1901)
Former Gas Holders (Sanborn 1946)
Former gasoline storage tanks (Sanborn 1946 & 1951)
ASPHALT PARKING LOT
ASPHALT PARKING LOT
Grass Area
NSPW MAIN OFFICE
OUR LADY OF THE LAKE SCHOOL
608.00
612.00
616.00
622.00
626.00
630.00
634.00
632.00
636.00
638.00
642.00
644.00
646.00
NORTH
GRAPHIC SCALE
0
30
60
120
(IN FEET)
1 inch = 60 ft.
LEGEND
NPL SITE BOUNDARY
SURFACE CONTOUR MAJOR
SURFACE CONTOUR MINOR
FENCE LINE
FILLED RAVINE EXTENT (APPROXIMATE)
UNDERGROUND PIPE REMNANTS
PROJECT:
ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN
TITLE:
FIGURE 1-3
FORMER MGP FEATURES
DRAWN BY: DDZ
CHECKED BY: PJS
APPROVED BY: DPT
SCALE: 1" = 60'
DATE: 30JULY2007
PROJECT: 25688375
SHEET: 1-3
URS
10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100



LEGEND

- FILL SOILS
- WOOD WASTE FILL
- CLAY (CL, CH)
- SILT (ML)
- SILTY SAND (SM)
- CLEAN SAND (SP)
- GRAVELLY INTERVALS (GP, GM, GC, SW)
- BEDROCK
- DNAPL
- MONITORING WELL/PIEZOMETER SCREENED INTERVAL
- * ARTESIAN FLOW ENCOUNTERED
- TOTAL VOC CONCENTRATION (ug/L) SAMPLED IN MARCH 2005 (DASHED WHERE INFERRED, NS = NOT SAMPLED).
- BASE OF MILLER CREEK FORMATION
- 602.10 GROUNDWATER ELEVATION (MEASURED NOV. 3, 2005)
- WATER TABLE (MEASURED NOV. 3, 2005)
- EQUIPOTENTIAL SURFACE WITHIN COPPER FALLS FORMATION (MEASURED NOV. 3, 2005)
- GROUNDWATER FLOW DIRECTION

NOTES:

1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
3. STRATIGRAPHY FOR AW-1 FROM GEOPHYSICAL SURVEY COMPLETED BY GEOSPHERE, INC. (NOVEMBER 2005).
4. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.

SCALE:
HORIZ. 1" = 80'
VERT. 1" = 20'

PROJECT: ASHLAND/NSP LAKEFRONT SITE
ASHLAND, WISCONSIN

TITLE: FIGURE 3-2
CROSS SECTION A-A'

DRAWN BY: BDZ	SCALE: AS SHOWN	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30.JULY.2007	SHEET 3-2
APPROVED BY: DPT		

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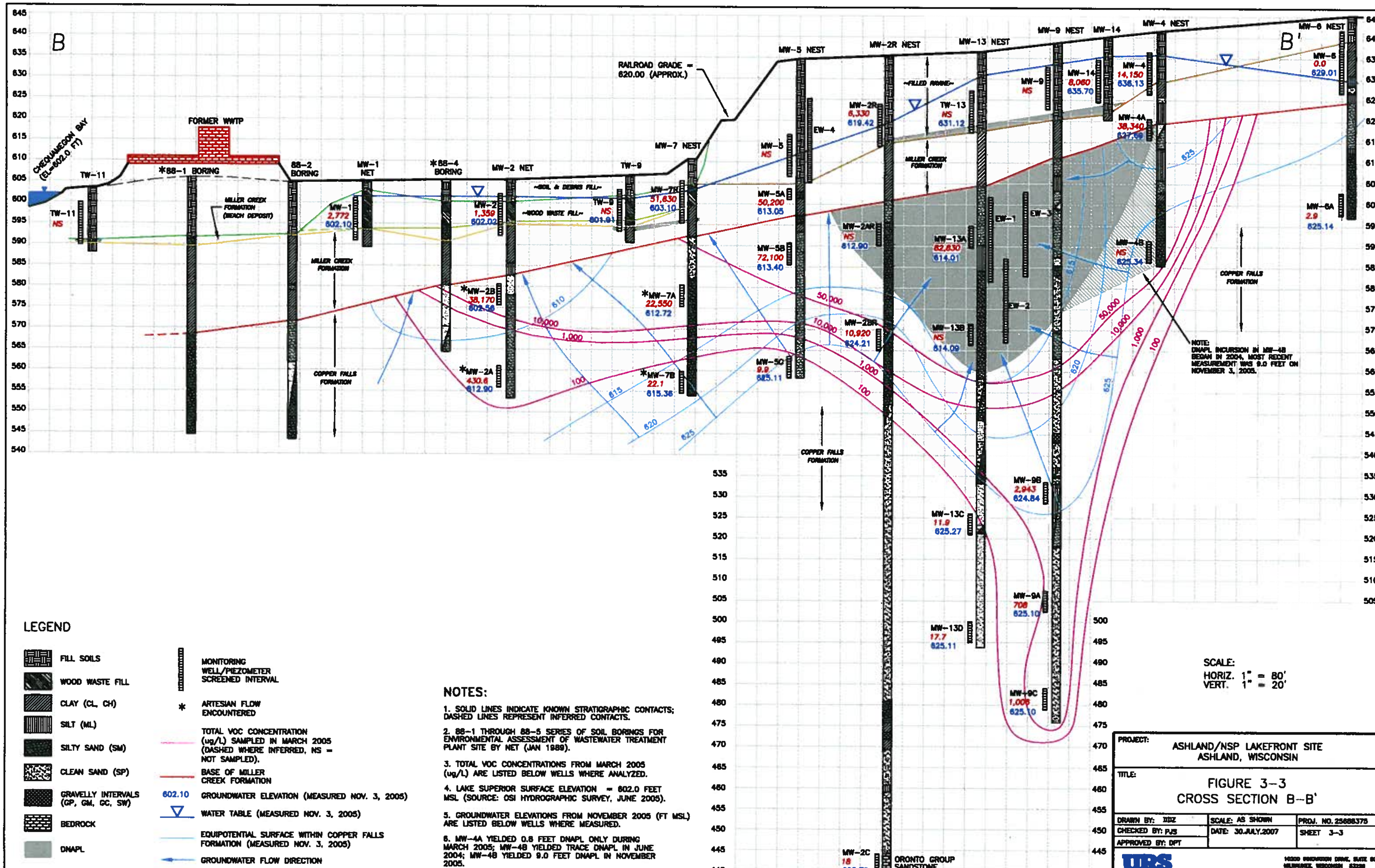
10200 INNOVATION DRIVE, SUITE 500
MILWAUKEE, WISCONSIN 53226
414-831-4100

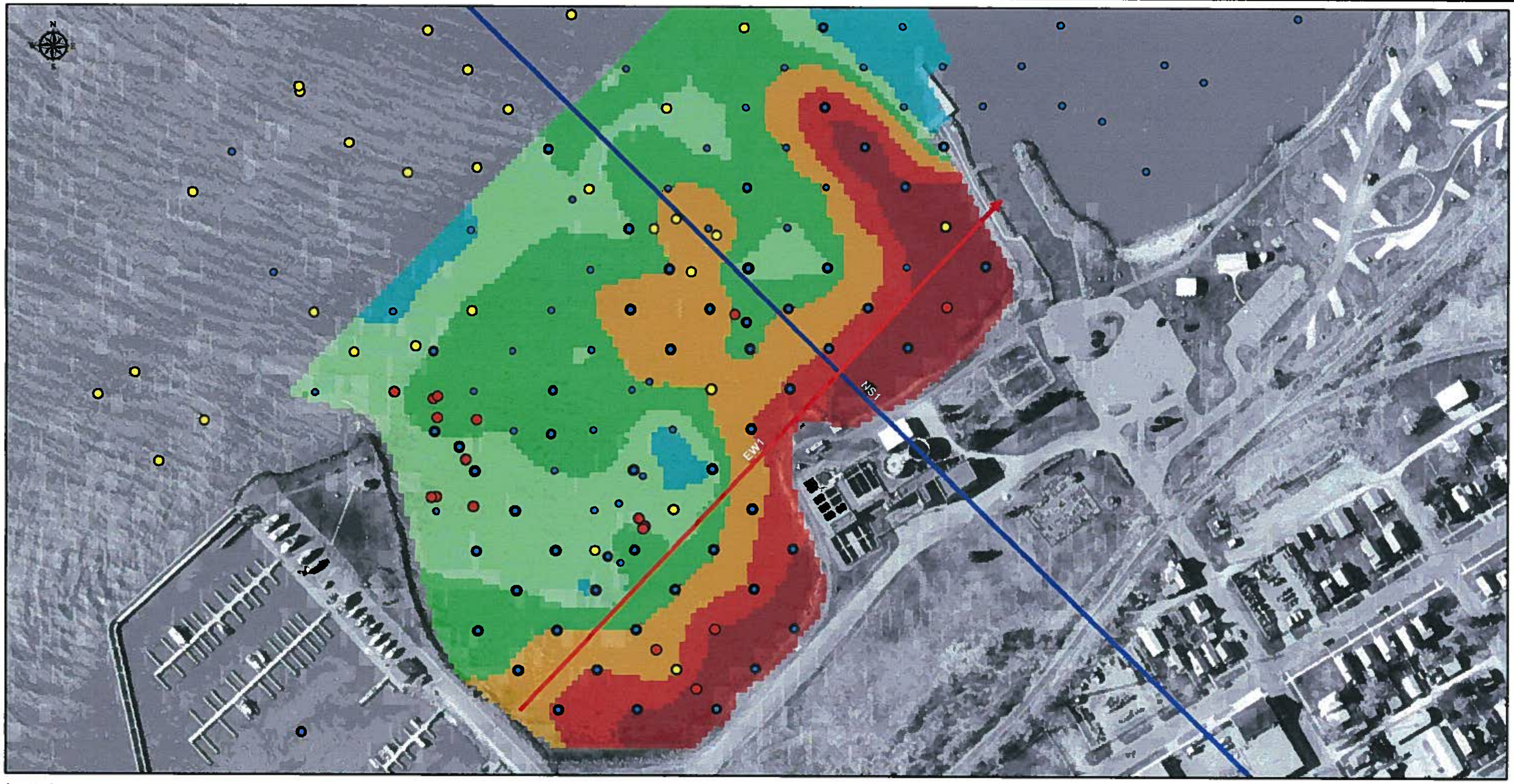


NOTES:

1. SOLID LINES INDICATE KNOWN STRATIGRAPHIC CONTACTS; DASHED LINES REPRESENT INFERRED CONTACTS.
2. 88-1 THROUGH 88-5 SERIES OF SOIL BORINGS FOR ENVIRONMENTAL ASSESSMENT OF WASTEWATER TREATMENT PLANT SITE BY NET (JAN 1989).
3. TOTAL VOC CONCENTRATIONS FROM MARCH 2005 (ug/L) ARE LISTED BELOW WELLS WHERE ANALYZED.
4. LAKE SUPERIOR SURFACE ELEVATION = 602.0 FEET MSL (SOURCE: OSI HYDROGRAPHIC SURVEY, JUNE 2005).
5. GROUNDWATER ELEVATIONS FROM NOVEMBER 2005 (FT MSL) ARE LISTED BELOW WELLS WHERE MEASURED.
6. MW-4A YIELDED 0.8 FEET DNAPL ONLY DURING MARCH 2005; MW-4B YIELDED TRACE DNAPL IN JUNE 2004; MW-4B YIELDED 9.0 FEET DNAPL IN NOVEMBER 2005.

PROJECT:	ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN	
TITLE:	FIGURE 3-3 CROSS SECTION B-B'	
DRAWN BY: DDZ	SCALE: AS SHOWN	PROJ. NO. 25688375
CHECKED BY: PJS	DATE: 30JULY2007	SHEET 3-3
APPROVED BY: DPT		

URS



Legend

Total PAH ug/kg with wood waste SiteXS

Total PAH ug/kg
- ND
- 0.1 - 1610.0
- 1610.1 - 22800.0
- >22,800

Cross Section Location
- West East
- North South 1

Wood Thickness (feet)

Feet
- <= 0.1
- 0.2 - 0.5
- 0.6 - 1
- 1.1 - 2
- 2.1 - 3
- 3.1 - 6.0

0 75 150 300 450 600 Feet

For north-south 1 cross section, see Figure 4-215.
For west-east 1 cross section, see Figure 4-216.

PROJECT: ASHLAND/NSP LAKEFRONT SITE ASHLAND, WISCONSIN			
TITLE: Figure 4-213 Sediment Sample Results - Total PAHs with wood waste layer - all depths			
DRAWN BY: DDZ	SCALE: AS SHOWN	PROJECT: 25688375	
CHECKED BY: PJS	DATE: 30.JULY 2007	SHEET: 4-213	
APPROVED BY: DPT			

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414-831-4100

Detailed Cost Estimate

Table F1-8
Alternate S5A: Limited Removal and On-site Thermal Treatment

Containment:

Excavation - Limited Removal		Volume to Remove	
Remove NAPL contaminated soil	1.7 ton/cubic yard	9,400 cy	NSPW Property South of St. Claire Street
		150 cy	NSPW Property North of St. Claire Street
		4,800 cy	Former Coal Tar Dump Area
Surface Barriers		Total Area:	
Asphalt Pavement -		26,000 sq ft	NSPW Property South of St. Claire Street
Includes 6 inches stone, 3 inches binder, 2 inches surface.		22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
Low Permeability Cap -			
Includes 3 feet of clay.		42,500 sq ft	Former Coal Tar Dump Area

Upper Bluff Area

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Gas Holder Removal	Est.	1	$30,000	$30,000	Removal/demolition of buried gas holders.
3	Excavation	cy	9,550	$5	$47,750	
4	Transportation for off-site landfill	ton	1,624	$25	$40,588	Assumes 10% of fill not suitable for thermal treatment
5	Sorting and Disposal (unsuitable material)	ton	1,624	$18	$29,223	
6	Thermal Treatment	ton	14,612	$100	$1,461,150	Thermal desorption and on-site placement of treated soil.
7	Backfill	cy	9,550	$12	$114,600	
8	Excavation de-watering equipment	Est.	1	$25,000	$25,000	Pumps and holding tanks
9	Waste water treatment	Gallon	144,000	$0.05	$7,200	Existing treatment system (5 gpm for 20 days)
10	Installation of new asphalt pavement	sq. yd.	48,000	$25	$1,200,000	NSPW Property North of St. Claire Street (includes grading)
11	Move/Abandon Existing Utilities	ls	1	$10,000	$10,000	Includes move/abandon existing buried sanitary and gas utilities
12	24 hr. Security of Site	weekly	4	$2,695	$10,780	$15/hr X 24 hr X 7 days + $25/day (expenses)
13	Perimeter Fence	ln ft	500	$20	$10,000	Fence around excavation area
				Subtotal	$3,036,291	
	Mobilization/Demobilization @	5%	of	$3,036,291	$151,815	
	Engineering @	15%	of	$3,036,291	$455,444	
	Construction Oversight @	15%	of	$3,036,291	$455,444	
				Subtotal	**$4,098,992**	
	Contingency @	20%	of	$3,036,291	$607,258	
				Total	**$4,706,250**	

Table F1-8
Alternate S5A: Limited Removal and On-site Thermal Treatment

Kreher Park

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear & Grub	est.	1	$10,000	$10,000	
2	Excavation	cy	4,800	$5	$24,000	Former coal tar dump area to 5 feet.
3	Transportation	ton	816	$25	$20,400	
4	Sorting and Disposal (unsuitable material)	ton	816	$18	$14,688	Assumes 10% of fill not suitable for thermal treatment
5	Thermal Treatment	ton	7,344	$100	$734,400	
6	Backfill	cy	4,800	$12	$57,600	
7	Excavation de-watering equipment	Est.	1	$25,000	$25,000	Pumps and holding tanks
8	Waste water treatment	Gallon	144,000	$0.05	$7,200	Existing treatment system (5 gpm for 20 days)
9	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
10	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
11	Vegetation	acre	1	$3,500	$3,500	Seeding
12	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
13	24 hr. Security of Site	weekly	2	$2,695	$5,390	$15/hr X 24 hr X 7 days + $25/day (expenses)
14	Perimeter Fence	ln ft	750	$20	$15,000	Fence around excavation area
	subtotal			Subtotal	$1,392,456	
	Mobilization/Demobilization @	5%	of	$1,392,456	$69,623	
	Engineering @	15%	of	$1,392,456	$208,868	
	Construction Oversight @	15%	of	$1,392,456	$208,868	
				Subtotal	$1,879,815	
	Contingency @	20%	of	$1,392,456	$278,491	
				Total	$2,158,306	

GRAND TOTAL $6,864,557

Summary

	Capital Costs	Mod / Demob	Engineering	Construction Oversight	Contingency	Estimated Cost
Limited removal and off-site disposal - upper bluff area	$3,036,291	$151,815	$455,444	$455,444	$607,258	$4,706,250
Limited removal and off-site disposal - Kreher Park	$1,392,456	$69,623	$208,868	$208,868	$278,491	$2,158,306
Total Estimated Cost	$4,428,746	$221,437	$664,312	$664,312	$885,749	$6,864,557

Long term groundwater monitoring costs are included with groundwater remedial alternatives.

Table F2-3

Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

Containment: **Surface Barriers**

		Total Area:	
1	***Asphalt Pavement -*** Includes 6 inches stone, 3 inches binder, 2 inches surface.	16,000 sq ft	NSPW Property South of St. Claire Street
		22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -*** Includes 3 feet of clay.	42,500 sq ft	Former Coal Tar Dump Area
		5,000 sq ft	TW-11 Area
		72,000 sq ft	WWTP Area

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	$105,556	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	$142,500	
	Contingency @	20%	of	$105,556	$21,111	
				Total	$163,611	

Kreher Park ***Shallow Groundwater - Kreher Park***
Former Coal Tar Dump and TW-11 Areas

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
3	Installation of low permeability cap	cy	5,278	$25	$131,944	3 ft. of clay over former coal tar dump area
4	Top Soil	sq. yd.	5,278	$18	$95,000	0.5 ft. topsoil cover over clay cap
5	Vegetation	acre	1.1	$3,500	$3,817	Seeding
6	Storm water Drainage System	est.	1	$30,000	$30,000	For water runoff during storm post-remediation
7	Vertical barrier wall - along shoreline	sf	38,750	$35	$1,356,250	Sheet pile wall (1,550 linear feet and 25 feet deep).
8	Vertical barrier wall - perimeter	sf	32,000	$35	$1,120,000	Sheet pile wall (2,000 linear feet and 16 feet deep).
9	Groundwater Diversion Trench	ln ft	1,525	$50	$76,250	Divert groundwater from upper bluff area around Kreher Park
10	Groundwater Extraction Wells	each	15	$2,500	$37,500	
11	Well Pumps	each	15	$2,500	$37,500	
12	Extraction Well Lateral Piping	ln ft	2,500	$100	$250,000	
13	Discharge Lateral Piping	ln ft	1,500	$75	$112,500	
14	Treatment equipment	each	1	$30,000	$30,000	
15	Building	each	1	$25,000	$25,000	
16	UST/OWS System	Est.	1	$15,000	$15,000	
17	Institutional Control Implementation	est.	1	$5,000	$5,000	Groundwater use and deed restrictions.
	subtotal			Subtotal	$3,607,983	
	Mobilization/Demobilization @	5%	of	$3,607,983	$180,399	
	Engineering @	15%	of	$3,607,983	$541,197	Includes WPDES permit application.
	Construction Oversight @	15%	of	$3,607,983	$541,197	
				Subtotal	$4,870,777	
	Contingency @	20%	of	$3,607,983	$721,597	
				Total	$5,592,374	

Table F2-3

Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

Shallow Groundwater - Kreher Park
WWTP Area

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	WWTP Building Demolition	est.	1	$250,000	$250,000	
2	Installation of low permeability cap	cy	8,000	$25	$200,000	3 ft. of clay at WWTP area (post demolition)
3	Top Soil	sq. yd.	8,000	$18	$144,000	0.5 ft. topsoil cover over clay cap
4	Vegetation	acre	1.7	$3,500	$5,785	Seeding
5	Storm water Drainage System	est.	1	$30,000	$30,000	For water runoff during storm post-remediation
				Subtotal	$629,785	
	Mobilization/Demobilization @	5%	of	$629,785	$31,489	
	Engineering @	15%	of	$629,785	$94,468	
	Construction Oversight @	15%	of	$629,785	$94,468	
				Subtotal	$850,210	
	Contingency @	20%	of	$629,785	$125,957	
				Total	$976,167	

Post Construction

Item No.	Item	Unit	Quantity	Unit Costs	Total	Notes
1	Annual Inspections	yr	30	$250	$7,500	
2	Post-Closure Reporting/Record Keeping	yr	30	$500	$15,000	
3	Cap Maintenance	yr	30	$1,000	$30,000	
4	Groundwater Extraction System O & M	yr	30	$57,600	$1,728,000	$4,800 per month
5	Groundwater monitoring	yr	30	$25,000	$750,000	shallow groundwater monitoring
6	Annual cap inspection and reporting	yr	30	$5,000	$150,000	
7	Groundwater treatment & disposal	yr	30	$112,500	$3,375,000	2,250,000 gallons per year (from infiltration)
			Subtotal	$201,850	$6,055,500	
	Present worth @7% Discount				$2,504,757	

GRAND TOTAL $9,236,909

Summary

	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Installation of surface barrier - upper bluff area	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Installation of surface & vertical barrier - Kreher Park	$3,607,983	$180,399	$541,197	$541,197	$721,597	$0	$5,592,374
WWTP Demolition and clay cap	$629,785	$31,489	$94,468	$94,468	$125,957	$0	$976,167
Post construction maintenance and monitoring (30 years)	$0	$0	$0	$0		$2,504,757	$2,504,757
Total Estimated Cost	$4,343,324	$217,166	$651,499	$651,499	$868,665	$2,504,757	$9,236,909

Includes groundwater monitoring costs for shallow groundwater

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

In-situ Treatment In-situ Chemical Oxidation

		Total Area:	
1	*Asphalt Pavement -* Includes 6 inches stone, 3 inches binder, 2 inches surface.	26,000 sq ft	NSPW Property South of St. Claire Street
		22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
2	*Low Permeability Cap -* Includes 3 feet of clay.	42,500 sq ft	Former Coal Tar Dump Area

Upland Area *Copper Falls Aquifer*

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Groundwater Extraction Wells	each	7	$5,000	$35,000	Additional extraction wells
2	Pumps	each	7	$2,500	$17,500	
3	Lateral piping	ln ft	1,000	$50	$50,000	
4	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
5	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
6	Drilling	per gal	750,000	$2	$1,500,000	500 holes, 1,500 gallons per hole @ $2 per gallon
7	Reagent Injection	per week	50	$7,500	$375,000	3,000 gallons per day
				Subtotal	$2,017,500	
	Mobilization/Demobilization @	5%	of	$2,017,500	$100,875	
	Engineering @	15%	of	$2,017,500	$302,625	
	Construction Oversight @	15%	of	$2,017,500	$302,625	
				Subtotal	$2,723,625	
	Contingency @	20%	of	$2,017,500	$403,500	
				Total	$3,127,125	

Post Construction *Copper Falls Aquifer*

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	7	$57,600	$403,200	Existing groundwater extraction system
2	Groundwater extraction (existing wells)	year	7	$394,200	$2,759,400	15 gpm @ $0.05
3	Groundwater Monitoring	year	7	$25,000	$175,000	
4	Annual report	year	7	$5,000	$35,000	
			Subtotal	$481,800	$3,372,600	
	Present worth @7% Discount				$2,596,420	
				Total	$5,723,545	

Shallow Groundwater - Filled Ravine

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Vent Well Installation	each	10	$2,500	$25,000	10 passive vent wells
3	Drilling	per gal	450,000	$2	$900,000	300 holes, 1,500 gallons per hole @ $2 per gallon
4	Reagent Injection	per week	30	$7,500	$225,000	3,000 gallons per day
5	Installation of new asphalt pavement	sq. yd.	2,889	$25	$72,222	NSPW Property South of St. Claire Street (includes grading)
6	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	$1,333,333	
	Mobilization/Demobilization @	5%	of	$1,333,333	$66,667	
	Engineering @	15%	of	$1,333,333	$200,000	
	Construction Oversight @	15%	of	$1,333,333	$200,000	
				Subtotal	$1,800,000	
	Contingency @	20%	of	$1,333,333	$266,667	
				Total	$2,066,667	

Post Construction *Shallow Groundwater - Filled Ravine*

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	7	$10,000	$70,000
2	Annual report	year	7	$2,500	$17,500
			Subtotal	$12,500	$87,500
	Present worth @7% Discount				$67,363
				Total	$2,134,029

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

Kreher Park — *Shallow Groundwater - Kreher Park*

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	Excavation	cy	3,935	$10	$39,352	
3	Bench scale test	est.	1	$5,000	$5,000	
4	Reagent Mixing	cy	3,935	$50	$196,759	
5	Drilling	per gal	225,000	$2	$450,000	150 holes, 1,500 gallons per hole @ $2 per gallon
6	Reagent Injection	per week	15	$7,500	$112,500	3,000 gallons per day
7	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
8	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
9	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
10	Vegetation	acre	1	$3,500	$3,500	Seeding
11	Storm water Drainage System	Basin	2	$30,000	$60,000	For water runoff during storm post-remediation
				Subtotal	$1,352,389	
	Mobilization/Demobilization @	5%	of	$1,352,389	$67,619	
	Engineering @	15%	of	$1,352,389	$202,858	
	Construction Oversight @	15%	of	$1,352,389	$202,858	
				Subtotal	$1,825,725	
	Contingency @	20%	of	$1,352,389	$270,478	
	Total			Total	$2,096,203	

Post Construction — *Shallow Groundwater - Kreher Park*

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	7	$15,000	$105,000
2	Annual report	year	7	$2,500	$17,500
	subtotal		Subtotal	$17,500	$122,500
	Present worth @7% Discount				$94,308
				Total	$2,190,510

GRAND TOTAL $10,048,085

In-situ chemical oxidation

Summary

In-situ chemical oxidation	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Copper Falls Aquifer	$2,017,500	$100,875	$302,625	$302,625	$403,500	$2,596,420	$5,723,545
Shallow Groundwater - Filled Ravine	$1,333,333	$66,667	$200,000	$200,000	$266,667	$67,363	$2,134,029
Shallow Groundwater - Kreher Park	$1,352,389	$67,619	$202,858	$202,858	$270,478	$94,308	$2,190,510
GRAND TOTAL	$4,703,222	$235,161	$705,483	$705,483	$940,644	$2,758,090	$10,048,085

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Removal — **Groundwater Extraction and On-site Treatment**

	Item	Total Area:	Notes
1	***Asphalt Pavement -***	16,000 sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***		
	Includes 3 feet of clay.	42,500 sq ft	Former Coal Tar Dump Area

Upland Area — ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Extraction wells	each	12	$7,500	$90,000	
2	Pumps	per gal	12	$3,500	$42,000	
3	Lateral piping	ln ft	1,500	$75	$112,500	
4	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
5	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
				Subtotal	**$284,500**	
	Mobilization/Demobilization @	5%	of	$284,500	$14,225	
	Engineering @	15%	of	$284,500	$42,675	
	Construction Oversight @	15%	of	$284,500	$42,675	
				Subtotal	**$384,075**	
	Contingency @	20%	of	$284,500	$56,900	
				Total	**$440,975**	

Post Construction — ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	30	$57,600	$1,728,000	Existing groundwater extraction system
2	Groundwater extraction (existing wells)	year	30	$394,200	$11,826,000	15 gpm @ $0.05
3	Groundwater Monitoring	year	30	$25,000	$750,000	
4	Annual cap inspection and reporting	year	30	$5,000	$150,000	
			Subtotal	**$481,800**	**$14,454,000**	
	Present worth @7% Discount				**$5,978,656**	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Total $6,419,631

Upland Area — ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	$105,556	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	$142,500	
	Contingency @	20%	of	$105,556	$21,111	
				Total	$163,611	

Kreher Park — ***Shallow Groundwater***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Extraction trench	ln ft	1,500	$150	$225,000	
2	Sump and pump	each	1	$20,000	$20,000	
3	Lateral piping	ln ft	1,500	$75	$112,500	
4	Treatment equipment	each	1	$30,000	$30,000	
5	Building	each	1	$25,000	$25,000	
6	UST/OWS System	Est.	1	$15,000	$15,000	
7	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina parking lot
8	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
9	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
10	Vegetation	acre	1	$3,500	$3,500	Seeding
11	Storm water Drainage System	Basin	2	$30,000	$60,000	For water runoff during storm post-remediation
				Subtotal	$966,278	
	Mobilization/Demobilization @	5%	of	$966,278	$48,314	
	Engineering @	15%	of	$966,278	$144,942	
	Construction Oversight @	15%	of	$966,278	$144,942	
				Subtotal	$1,304,475	
	Contingency @	20%	of	$966,278	$193,256	
				Total	$1,497,731	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Post Construction ***Shallow Groundwater***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	30	$57,600	$1,728,000	
2	Waste-water treatment & disposal	year	30	$1,314,000	$39,420,000	50 gpm @ $0.05
3	Groundwater Monitoring	year	30	$25,000	$750,000	
4	Annual cap inspection and reporting	year	30	$5,000	$150,000	
	subtotal			$1,401,600	$42,048,000	
	Present worth @7% Discount				$17,392,454	
				Subtotal	**$18,890,185**	

GRAND TOTAL $25,415,372

Summary	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Copper Falls Aquifer	$284,500	$14,225	$42,675	$42,675	$56,900	$5,978,656	$6,419,631
Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Shallow Groundwater - Kreher Park	$966,278	$48,314	$144,942	$144,942	$193,256	$17,392,454	$18,890,185
GRAND TOTAL	$1,356,333	$67,817	$203,450	$203,450	$271,267	$23,371,111	$25,473,427

SED-6B Near Shore Dry Excavation and Outer Bay Mechanical Dredging - Thermal Treatment - Off-site Disposal - Sand Cap

Total Area:	896,960	sq ft	Based upon GIS calculations
Total In-Place Sediment Volume:	133,906	cy	Includes volume of water in sediments
Sediment Volume to be Dredged in-the-Dry:	76,492	cy	Includes volume of water in sediments; Assuming an average excavation depth of 6 - 7 ft
Sediment Volume to be Mechanically Dredged:	57,414	cy	Includes volume of water in sediments; Assuming an average excavation depth of 3 - 4 ft
Total Volume of Large Wood/Debris Waste:	26,781	cy	Assumed to be 20% of total sediment volume;
Sediment Volume to be Dry Dredged that is not Large Wood/Debris:	49,711	cy	All large wood/debris assumed to be in the Dry Dredge area; Small wood debris will be removed with sediments that are mechanically dredged and is include in the volume to be dredged
Total Volume of Water to be treated by WWTP:	58	Mgal	8 Mgal from mechanical dredging; 60 Mgal from dry dredging (including lake and ground water removal), 10 Mgal of which is lake water that is assumed not to need treatment

Mobilization/Demobilization

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Mob/Demob	ls	1	$2,232,681	$2,232,681	Estimate at 5% of total costs except without engineering, contingency and LT monitoring

Pre-Construction Activities

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Perimeter Fence	lf	1680	$20	$33,600	Fence along land side where there is no sheet pile wall (with 20 ft overlap), back to the railroad tracks
2	Bathymetric Survey	ea	3	$37,500	$112,500	Pre-investigation and Pre- and Post Dredge - Bathymetric Survey
3	Pretrenching along Proposed Landward Sheet Pile Alignment	day	11	$1,800	$19,800	2105 ln ft at appx 200 ln ft per day
4	Removal of Existing Site Features	ls	1	$100,000	$100,000	
5	Move/Abandon Existing Utilities	ls	1	$100,000	$100,000	Includes installation of electric upon completion ($40k) & move/abandon existing utilities ($60k)
				Subtotal	$365,900	

Containment with Sheet Pile Wall approximately 180 feet from shoreline and Wave Attenuator

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	1380 linear feet of WhisprWave® Floating Wave Attenuator	lf	1380	2286	$3,155,150	Purchase, ship, and install wave attenuator device
2	Install HC Boom in Lake	lf	1920	$4	$7,680	Install HC Boom on one side of piling and extend to shorelines; assume same length as sheetpiling in lake
3	North Sheetpiling (In Lake)	sf	96000	$62	$5,952,000	Includes $56 sq/ft for PZ35 piling (35lbs/sq ft @ $0.80/lb + $28 for installation), $6 sq/ft for seal, depth piling 50 Length,ft: 1920
4	West Sheetpiling	sf	17680	$62	$1,096,160	Includes $56 sq/ft for PZ35 piling (35lbs/sq ft @ $0.80/lb + $28 for installation), $6 sq/ft for seal, depth piling 52 Length,ft: 340
5	East Sheetpiling	sf	19800	$62	$1,227,600	Includes $56 sq/ft for PZ35 piling (35lbs/sq ft @ $0.80/lb + $28 for installation), $6 sq/ft for seal, depth piling 33 Length,ft: 600
6	South Sheetpiling	sf	31455	$62	$1,950,210	Includes $56 sq/ft for PZ35 piling (35lbs/sq ft @ $0.80/lb + $28 for installation), $6 sq/ft for seal, depth piling 27 Length,ft: 1165
7	Remove HC Boom from Lake	lf	1920	$4	$7,680	Remove HC Boom on one side of piling and extend to shorelines
8	Dispose HC Boom	ea	3	$600	$1,800	Dispose of HC Boom in 20 cy. roll off boxes
9	Silt Fence	lf	1640	$20	$32,800	Along south, east, and west sides of Kreher Park, back to the railroad track, beyond the sheetpile wall
				Subtotal	$13,431,080	

Sediment Drainage Pad

Item No.	Item	Unit	Quanitity	Unit Costs	Total	Notes
1	Asphalt Drainage Pad Construction	sq yd	4170	$45	$187,650	150 ft x 250 ft = 37,500 sq ft = 4,170 sq yd
2	Pumping excess/drained water to WWTP	day	240	$300	$72,000	
				Subtotal	$259,650	

Dry Dredging Sediment Removal

Item No.	Item	Unit	Quanitity	Unit Costs	Total	Notes
1	Cutoff and Remove Old Pilings	ea	40	$500	$20,000	
2	Remove Existing Shoreline Riprap	ton	7500	$20	$150,000	Appx. 320 cu yds per day
3	Excavate, Load, Haul, and Dump Sediments	cy	76492	$24	$1,835,808	Excavate and load sediments into trucks; dump sediments in asphalt drainage pad area
4	Confirmation Samples	ea	200	$200	$40,000	
6	Temporary Barriers	ea	30	$1,500	$45,000	Jersey barriers to provide separation of areas
				Subtotal	$2,090,808	

Mechanical Dredging Sediment Removal

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Install silt curtain outside dredge area	sq ft	16560	$10	$165,800	Install silt curtain; assume 12 ft depth and same linear footage as wave attenuation device
2	Install HC Boom	ft	1600	$4	$6,400	Install HC Boom on lake side of sht pile wall
3	HC Boom Removal	ft	1600	$4	$6,400	Removal of HC Boom into roll off box
4	Dispose of Boom	ea	2	$1,500	$3,000	Dispose of HC Boom in two 20 cy. roll off boxes
5	Mechanically Dredge Sediment	cy	57414	$30	$1,722,420	Mechanically dredge sediments to depth of 3 ft (Includes transport to land cost). Assume 200 cy/day of affected sediment
6	Air Emissions Monitoring	weeks	60	$8,725	$523,500	Monitor air quality during construction and dredging based on 5 stations 3 times/week using NIOSH methods
7	Water Quality Monitoring	weeks	60	$9,000	$540,000	Daily Water Quality Monitoring through dredging process
				Subtotal	$2,967,320	

SED-6B Near Shore Dry Excavation and Outer Bay Mechanical Dredging - Thermal Treatment - Off-site Disposal - Sand Cap

Waste Separation

Item No.	Item	Unit	Quanitity	Unit Costs	Total	Notes
1	Remove Large Wood/Debris Waste	day	240	$1,800	$432,000	Load at $1800/day for period of ~240 days of sediment processing
2	Screening	day	240	$2,500	$600,000	Screening system to separate wood from sediments
3	Dispose Large Wood/Debris Waste at 20 cu yd per roll-off box	ea	1340	$1,500	$2,010,000	Dispose of large debris as special waste in a 20 cy. roll off box. Assume 30% is large waste.
4	Waste Sampling for Landfilling	ea	10	$400	$4,000	
5	Filterpress Dewatering of Mechanically Dredged Sediments	cy	57414	$35	$2,009,490	Total dredged rate based on bids; Assumes all large wood/debris is in dry dredged area
6	Excavator	day	240	$1,800	$432,000	$1800 per day for an excavator and truck to transport sediments to the thermal treatment area
				Subtotal	$5,487,490	

Thermal Treatment

Item No.	Item	Unit	Quanitity	Unit Cost	Total	
1	Thermal Treatment of Mechanically Dredged Sediments	ton	48420	$100	$4,841,976	See Sediment vol/wt calc sht for tonnage calc
2	Thermal Treatment of Dry Dredged Sediments	ton	41430	$100	$4,143,000	Dry dredged non-large wood/debris mat'l; assumes initial wet sed. wt of 1.2 tons/cu yd & 46.3% solids by wt; dry wt x 1.5 = moist, dewatered sed. wt
				Subtotal	$8,984,976	

Sediment Transport and Disposal

Item No.	Item	Unit	Quanitity	Unit Cost	Total	
1	Load Mechanically Dredged Sediments	day	43	$1,440	$62,082	40 trucks/day X 20 tons/truck = 800 tons/day; $1.80 per ton
2	Haul Mechanically Dredged Sediments to Landfill	ton	34490	$27	$931,230	Assumes initial wet sediments weight of 46.3% solids by wt; dry wt x 1.1 = thermal treated sediment wt
3	Disposal of Mechanically Dredged Sediments	ton	34490	$18	$620,820	Tipping Fee
4	Load Dry Dredged Sediments	day	38	$1,440	$54,702	40 trucks/day X 20 tons/truck = 800 tons/day; $1.80 per ton
5	Haul Dry Dredged Sediments to Landfill	ton	30390	$27	$820,530	Assumes initial wet sediments weight of 1.2 tons/cu yd & 46.3% solids by wt; dry wt x 1.1 = thermal treated sediment wt
6	Disposal of Dry Dredged Sediments	ton	30390	$18	$547,020	Tipping Fee
7	Disposal of NAPL offsite	gal	5000	$8	$40,000	Same units used in 1998 cost
8	Cut Perimeter Sheet Pile Wall and Dispose of Piling	sf	8420	$25	$210,500	Three sides of site; 4 ft x total East, West, and South piling lengths
9	Remove Piling in Bay	sf	96000	$0	$0	Cost Included in installation price
10	Remove Asphalt Drainage Pad and Dispose	sq yd	4170	$10	$41,700	
				Subtotal	$3,326,584	

Ground Water Capture System Upgradient of Containment Wall

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Trench Excavation	lf	1165	$50	$58,250	16 ft deep by 3 ft wide
2	Contaminated Soil Disposal	tons	3495	$60	$209,700	Dispose as special waste at $60/ton; Assumes 1.5 tons/cu yd
3	Trench Filter Fabric	sf	48930	$1	$48,930	Fabric along both sides and the bottom of the trench, and between the gravel backfill and the overlying soil backfill material
4	Gravel Backfill	tons	2716	$20	$54,367	From 4 ft to ~18 ft bgs, 3 ft wide; 1.5 tons/cu yd
5	Collection Pipe, 4-in HDPE Perforated	lf	1245	$30	$37,350	1165 ft of pipe in trench, 4 - 20 ft segments from the sumps to the header
6	Trenching, Backfill, and Compaction	cy	518	$20	$10,356	Soil material above the gravel in the trench; from 0 to 4 ft bgs; 1.5 tons/cu yd
7	Discharge Piping, 6-in HDPE	lf	1335	$38	$50,730	1165 ft of header pipe placed on ground surface, 170 ft from header pipe to WWTP
8	Connection to Sanitary Pump Station	ea	1	$2,000	$2,000	
9	Water Samples	ea	100	$200	$20,000	
10	Collection Sump	ea	4	$2,000	$8,000	
11	Sump Pump	ea	4	$4,500	$18,000	
12	Sump Level Controls	ea	4	$2,500	$10,000	
13	Electrical Conduit	lf	1245	$10	$12,450	1065 ft of conduit pipe placed on ground surface, and 4 - 20 ft segments from the sumps to the header
14	Misc. Electrical	ls	1	$10,000	$10,000	
15	Grout Ground Water Treatment System Trench at end of Project	cy	820	$25	$20,500	16 ft deep, 3 ft wide, 1165 lf; assumes 35% void space
				Subtotal	$570,632	

Lake Water Removal System Inside of Containment

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	2 Pumps at 500 gpm w/ Operator to Initially Drain Bay	day	10	$7,840	$76,400	[$85/hr x 6 hrs + 127.50/hr x 16 hr + $1200/day pump] x 2; ~12million gal inside SPW; 2 - 500gpm pumps = 1,440,000 gpd; added ~2 add'l days for rain, gw, and lake water Infiltration
2	Sump pumps variable discharge 10 to 100 gpm	ea	8	$4,500	$36,000	Dewater sediments
3	Collection/discharge piping, 12-in HDPE	lf	3280	$5.50	$18,040	Two collection pipes runs on land along Bay from the NW and NE corners of the Bay until reaching WWTP; Discharge pipe runs to the east to Lake Superior (east of the containment area)
4	Connection to WWTP	ea	3	$2,000	$6,000	Two intake connections from each side of the Bay (West and East), one outgoing connection for treated water going to Lake Superior
5	Start-up Samples	ea	200	$200	$40,000	
6	Electrical Conduit	lf	1450	$10	$14,500	Runs on land along Bay to the west and east, connects up with the Ground Water Capture System conduit to the south
7	Connection to City Power Supply	ls	1	$20,000	$20,000	Connection and transformer
				Subtotal	$212,940	

SED-6B Near Shore Dry Excavation and Outer Bay Mechanical Dredging - Thermal Treatment - Off-site Disposal - Sand Cap

Ground/Lake Water Treatment System

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
	Year 1 Set up					
1	Oil Water Separator and associated system (200 gpm) (purchase)	ea	1	$30,000	$30,000	
2	Fuel and energy surcharge (estimated 8.65%)	ea	2	$1,298	$2,595	
3	Connecting piping, pumps, accessories	ea	1	$20,000	$20,000	
	Subtotal				*$52,595*	
	Year 1 and 2 Operation					
	Carbon Adsorber System (1500 gpm)					Assumes activated carbon of lake water sufficient to discharge water back into Lake Superior
1	*Rental Initiation: mobilization, set-up, carbon*	ea	2	$49,335	$98,670	For use at the beginning of each work season
2	*Rental**	months	6	$5,000	$30,000	*There is a three month minimum rental for each of the units
3	*Rental Termination: carbon removal, demobilization*	ea	2	$41,935	$83,870	
	Carbon Adsorption System and Bag System for Filtration (200 gpm)					Assumes activated carbon of lake water sufficient to discharge water back into Lake Superior
1	*Rental initiation: mobilization, set-up, carbon*	ea	1	$28,675	$28,675	For use after returning the 1500 gpm units
2	*Rental***	months	5	$1,500	$7,500	
3	*Rental Termination:carbon removal,system disassembly,demob*	ea	1	$39,350	$39,350	
4	*Carbon Sand Filtration*	Mgal	58	$67,000	$3,886,000	Stryker Bay Cost Estimates
5	*Water Quality Testing*	Mgal	58	$2,400	$139,200	Stryker Bay Cost Estimates
6	*BF400 Four Bag Filter Skid*	months	11	$4,000	$44,000	
7	*Filter Bags (5 micron rating) - Bag of 50*	cases	12	$600	$7,200	
8	Fuel and energy surcharge (estimated 8.65%)	ea	1	$359,142	$359,142	
9	Dispose soil in filter bags (special waste)	tons	27	$60	$1,620	All filter bags will fill with fines and have to be disposed as special waste. Assumed average cost is $60/ton.
10	Oil Disposal	gallons	350	$3	$1,050	Oil from oil/water separator will be collected in a 55 gallon drum and disposed as necessary.
11	Operation and Maintenance (labor)	hours	6000	$100	$600,000	Two employees for 50 hours per week for operations and maintenance.
12	Oil Water Separator O&M	Mgal	58	$2,700	$156,600	Stryker Bay Cost Estimates
	Subtotal				*$5,482,877*	
				Subtotal	**$5,535,472**	

Clean Sand Capping and Shoreline Restoration

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Clean Sand Fill and Install	cy	30000	$25	$750,000	Place 30,000 cu yds of sand in the dry dredge area
2	Clean Sand Fill and Install	cy	12907	$25	$322,667	Apply 0.5 ft of sand over the entire area
3	Install Rip-Rap Shore Protection	ton	1360	$40	$54,400	~2600 lf of shorline inside 2900N, 8ft wide, 1 ft thick rip-rap = 20,800 cu ft of rip-rap = 1360 tons @ 130 pcf
4	Survey	ea	1	$37,500	$37,500	Post-capping bathymetric survey
				Subtotal	**$1,164,567**	

Miscellaneous

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Develop HASP	ls	1	$10,000	$10,000	$100/hr X 40 hr/wk X 2.5 weeks
2	Health & Safety Personnel	day	76	$1,440	$109,440	Once a week, for 2 years (38 weeks/yr)
3	24 hr Security of Site	weeks	50	$2,695	$134,750	$15/hr X 24 hr X 7 days + $25/day (expenses); 30 weeks of work
				Subtotal	**$254,190**	

Subtotal:	$46,886,292	
Engineering @ 15%:	$7,032,944	
Oversight @ 15%:	$7,032,944	
Subtotal:	$60,952,179	
Contingency @ 20%:	$9,377,258	Only taken on Capitel Costs not Engineering
TOTAL:	**$70,329,437**	

Post-Construction:

Item No.	Item	Unit	Quanitity	Unit Cost	Total	Notes
1	Monitoring	yr	30	$40,000.00	$1,200,000	
2	Reporting	yr	30	$12,000.00	$360,000	Post-Closure Reporting
3	O&M	yr	30	$10,000.00	$300,000	
				Subtotal	**$1,860,000**	
	Present worth @ 7% discount factor				**$715,090**	

GRAND TOTAL: $71,044,527

Attachments

Letters from Stakeholders

City of Ashland Comments to the EPA National Remedy Review Board Ashland Northern States Power Lakefront Superfund Site.

Thank you for the opportunity to offer comments and concerns of the City of Ashland (City) to the EPA National Remedy Review Board. The City has been named as a PRP in this site and currently owns the lakebed fill area known as Kreher Park. The City acquired the Schroeder Lumber property (eastern 3/4 of the fill area) through tax deed in 1943. In 1952, the city constructed a municipal wastewater treatment plant on the site of the historic Schroeder Lumber facility just lake-side of the filled ravine and the heavily contaminated areas known as "the seep" and the "coal tar dump". The remaining western ¼ was purchased in 1986 for the construction /development of our current Marina and the Marina Park peninsula.

For nearly two decades, redevelopment and even productive re-use of this site has been stalled by the existence of MGP related contamination and the lengthy process intended to deal with it. As the virtual center of the City's waterfront, cleaning up the Site and returning it to productive use will allow us to develop its potential as an economic engine for the community and entire Chequamegon Bay region.

The Site has generally been described in terms of 4 areas of concern, each with unique contaminant characteristics and remediation challenges. Those areas are referred to as the:

- Filled Ravine and Service Center (shallow ground water, former MGP and bluff)
- Copper Falls Aquifer (deep ground water)
- Kreher Park (City owned lake bed fill)
- Sediments (open waters of Chequamegon Bay)

(The attached Exhibit A is an aerial map of the Site and roughly identifies these physical areas.)

We have reviewed the comments provided by both Northern States Power – Wisconsin (NSPW) and the Wisconsin Department of Natural Resources (WDNR) with respect to each of these areas and strongly support those remedy recommendations upon which they agree. In specific remedy approaches where they differ, we still find them to be generally well intentioned and understand the reason and concern offered by both for their respective preferences.

Consistent with the framework adopted by the City, NSPW and WDNR, our common interest is in a long-term cleanup solution that:

- is protective of human health and the environment;
- can be accomplished in a timely, efficient and cost effective manner;
- will limit the period of disruption to residents, users and developers of the area;
- retains the current land area in Kreher Park (lakebed fill) for Marina support and recreation; and
- dovetails into the City's waterfront and economic development plans to promote and sustain our local economy (see attached Exhibits B1 and B2)

Please consider the following comments and help us to advance these common interests as you develop a remedy recommendation for the Ashland Northern States Power Lakefront Superfund Site:

Filled Ravine and Bluff

The City considers this area a key to tying our highway commercial district with our waterfront, building on the strengths and unrealized potential of both. The City is committed to working with NSPW to move the Service Center operations, allowing this area to be redeveloped to take advantage of its unique size and location: more than a square block of property with one face on the US Highway 2 and the other on Kreher Park and Chequamegon Bay.

The City agrees with the apparent consensus recommendations of NSPW and WDNR to support the methods identified in remedy options S-5A, GW-2A and GW-6 for addressing the contaminated media of the filled ravine and bluff.

Copper Falls Aquifer

The City is not prepared to wade into debate on the technical merits of GW-6 vs. GW-3 or GW-9B vs. GW-9A. The primary interest of the City, in choosing remedial actions for this area, is to arrest and prevent further expansion of the contaminant plume within the aquifer, effect increased removal or degradation of contaminants, and accomplishing this while not materially obstructing or preventing redevelopment of the overlying surface property.

The City is also hopeful that the artesian well, located on the marina peninsula, can be reopened for use and that the remedy is effective at preventing contamination of the artesian water source.

Kreher Park

Maintaining the general boundary and surface area of the current lakebed fill is essential to the operation of the current marina and our future waterfront development plans for this central lakefront area. Yet it is very important that this area be cleaned up to allow for the types of uses envisioned in our Waterfront Development Plan and that any remaining contaminants be contained and treated to prevent future migration and recontamination of the lake waters and sediments.

The City agrees that the consensus recommendation of NSPW and WDNR to support the methods identified in remedy options S-5A, GW-2 and GW-6 will address the City's interest for remediation and reuse this area.

Sediments

The bay sediments appear to be the most technically challenging and potentially costly area of the Site. Considering the direct impact on human health and the lake environment, it is important that this be done right. The City agrees with

WDNR and NSPW that a dredging (removal) solution is preferred as the most cost effective long-term remedial option for this area. The City further agrees that details of the dredging methods and the extent to which various methods are used should be the subject of pre-design testing and field verification prior to selection. The chosen dredging and disposal methodology must then be subject to a comprehensive monitoring and sampling plan.

The City believes it is essential to the goal of a protective cleanup, that any methodology be verified for effectiveness, confirming that the PRG has been met within a reasonable time frame after cleanup. And, that the methodology prevents escape and migration of contaminates and limits recontamination of the sediments. With that assurance, we can support any effective dredging methodology.

Cost and duration of cleanup of the sediments, and the entire Site are important concerns. Citizens of Ashland and the entire NSPW service area may experience significant rate increases as costs of the cleanup are passed through to the gas and electric customers of NSPW. Also, the longer the cleanup process, the greater the cost and the longer it will take to develop the full potential of our City with the Lake Superior waterfront at its core. The City will work with NSPW and WDNR to identify ways of combining efforts and funding opportunities that result in overall cost savings, timely completion and enhanced redevelopment/reuse potential.

The City of Ashland appreciates the efforts of WDNR staff, EPA Region 5 staff and NSPW representatives to provide and select FS alternatives that balance the needs for a protective, timely and cost effective cleanup; one that is sensitive to citizen input and supportive of our economic and waterfront development plans. We especially thank NSPW for initiating the collaborative stakeholder meetings and WDNR for participating in those meetings and the resulting framework for cooperation. We look forward to continuing in this cooperative relationship as we take the final steps towards actual cleanup of this site.

Edward Monroe, Mayor

Richard Dowd, Council President

9-8-08

Brian Knapp, City Administrator

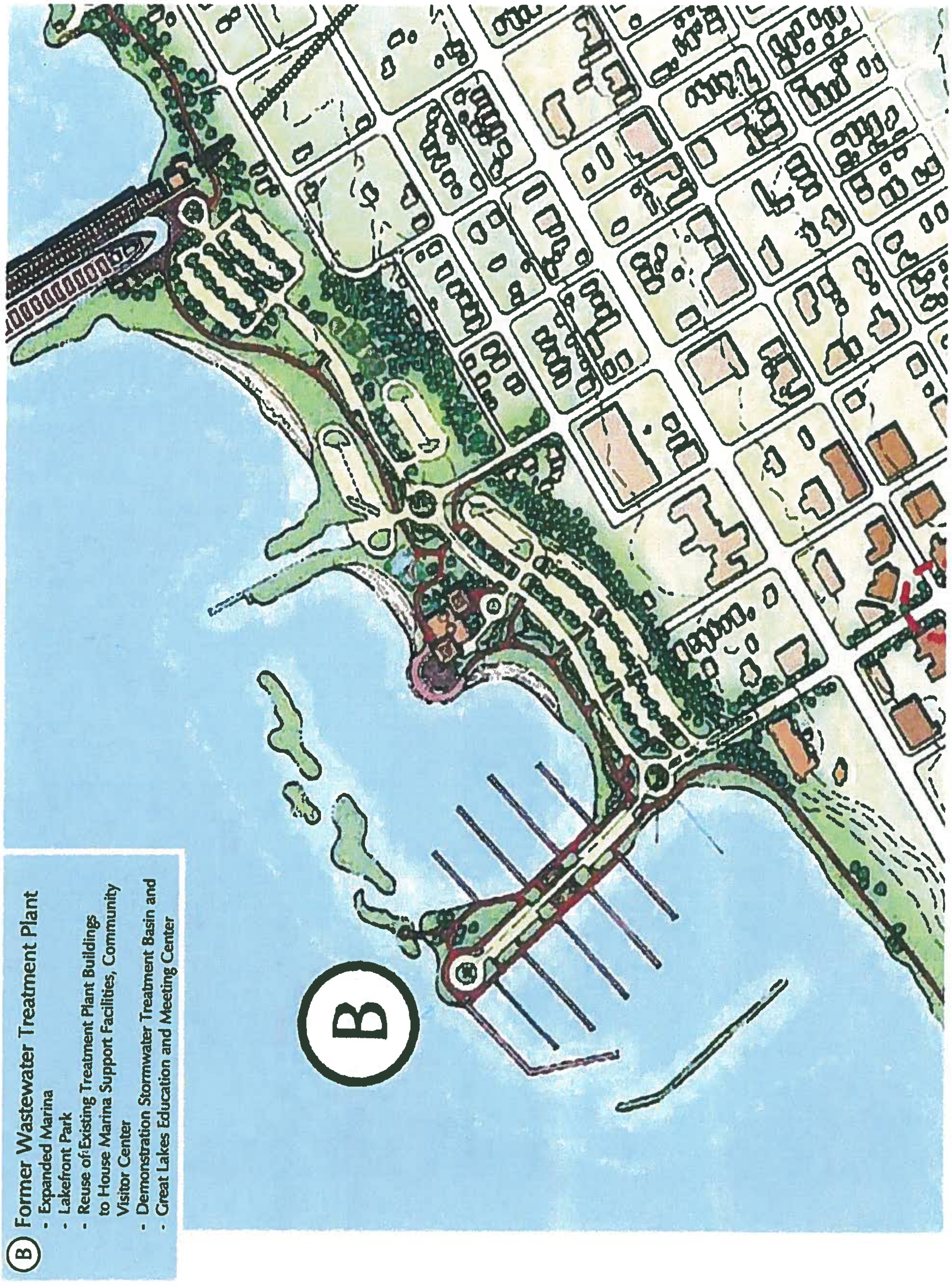
Exhibit A

SEDIMENTS
MONKS LN
KREHER PARK
NSPW SERVICE CENTER
PRENTICE AVE
ST. CLAIRE S
N ELLIS AVE
LAKE SHORE DR E
2
LAKE SHORE DR W
MAIN ST E
MAIN ST W
13
2
2ND AVE W
3RD AVE W
ASHLAND / NSP LAKEFRONT SITE
ASHLAND, WI
NPL Site Boundary (approximate)
Extent of Soil Contamination (approximate)
Filled Ravine Extent (approximate)
City of Ashland
09/08/08
2005 Aerial Photograph

Exhibit B1

Ashland
WISCONSIN
Lake Superior's Hometown
Waterfront Development Plan
Prepared for: The City of Ashland Revised 2002
Plan Description and Goals
SmithGroup JJR
Clarkson Dock
Historic Soo Line Ore Dock
Former Wastewater Treatment Plant
Reiss Coal Dock
City History

Exhibit B2


B Former Wastewater Treatment Plant
- Expanded Marina
- Lakefront Park
- Reuse of Existing Treatment Plant Buildings to House Marina Support Facilities, Community Visitor Center
- Demonstration Stormwater Treatment Basin and
- Great Lakes Education and Meeting Center
B

EPA National Remedy Review Board
Ashland/NSP Lakefront Site
November 18, 2008
Statement by Northern States Power Company

Background

Northern States Power Company, a Wisconsin corporation, d/b/a Xcel Energy (NSPW), appreciates the opportunity to provide the National Remedy Review Board (Board) comments on the cleanup options under consideration for the Ashland/NSP Lakefront Site (Site). We support the Board's mission of promoting consistent and cost-effective response actions for complex sites. As such, we strongly advocate the selection of the specific remedial options presented below as those that best comport with the considerations set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Since NSPW was first notified in 1994 by the Wisconsin Department of Natural Resources (WDNR) of contamination at the Site, NSPW has engaged in a comprehensive investigation of the Site's history. At the request of the EPA, NSPW submitted its findings in a report titled the Ashland/NSP Lakefront Site PRP Investigation Report dated June 20, 2006. Subsequently, NSPW submitted two addenda: May 30, 2007 and July 9, 2008. This report (with addenda) documents the recollections of dozens of witnesses (via depositions and affidavits) and compiles and reviews historical records, engineering drawings, photographs, and similar archives. The report concludes that other entities (beyond the former MGP) contributed to the contamination at the Site, including the Schroeder Lumber Company (Schroeder). Schroeder, long since bankrupt, operated a wood treatment facility at the Site. Forensic evidence and depositions of eye witnesses corroborate the release of creosote and other hazardous substances throughout that portion of the Site once occupied by Schroeder. The City of Ashland (City), subsequent owner of the Schroeder property, and two railroads, the Canadian Pacific and the Canadian National, also have potential liability at the Site pursuant to CERCLA. Copies of this submittal are available upon request.

In addition to the historical reviews, NSPW has 1) implemented two interim response actions at the Site, 2) conducted a groundwater cleanup demonstration study pursuant to EPA's SITE program, and 3) performed a Remedial Investigation and Feasibility Study (RI/FS) pursuant to an Administrative Order on Consent (AOC). In 2000, NSPW installed a tar removal system to treat groundwater beneath the former manufactured gas plant (MGP). A second interim action was performed in 2002 when NSPW removed and capped a seep area in the city park. In 2006 and early 2007, NSPW demonstrated the performance of an innovative *in situ*, chemical oxidation technology to treat groundwater and contaminated soil as part of EPA's SITE program. Indeed, since 1994 consultants for WDNR and NSPW have fully investigated the nature and extent of contamination at the Site. The compilation of this work is reflected in the Remedial Investigation Report (RI) prepared by NSPW and approved by EPA on February 5, 2008. The Draft Feasibility Study Report (FS) was submitted in October 2007, followed by a revised draft in May 2008. According to EPA's remedial project manager (RPM), the FS is anticipated to be approved this fall.

In anticipation of that approval and the presentation of the Site before the Board, NSPW initiated this summer a series of stakeholder meetings to explore interest in collaborating for Site cleanup. The parties involved in the first meeting held on June 5th included the City, WDNR and NSPW. During the meetings, NSPW presented a framework for a collaborative Site cleanup, including the sediments in Chequamegon Bay of Lake Superior (Bay). While the discussions are ongoing and a number of details remain to be worked out, NSPW is pleased to report that its framework for cleaning up the Site (as described herein) has generally been well received and the City and WDNR have indicated they acknowledge the merits of the proposed framework.

While the media specific remedies proposed by NSPW in this statement may not be identical to the integrated remedial scenarios that may be presented to you by the RPM, <u>Remedial Scenario IV in the FS embodies most of the ideas supported by NSPW and the concepts receiving support among the stakeholders meeting in Ashland</u>.

All the integrated remedial scenarios presented in the FS are consistent with the NCP and relevant Superfund policy and guidance. Furthermore, NSPW has fully evaluated all the cleanup alternatives pursuant to the nine CERCLA-defined FS evaluation criteria. That evaluation is available in the <u>Comparative Analysis of Alternatives Technical Memorandum – Ashland/Northern States Power Lakefront Superfund Site</u> and is further presented in the FS.

Sediment

The media of greatest concern and cost at the Site is the bay sediments. Subject to certain important conditions, NSPW is prepared to contribute substantial funding to excavate or dredge the sediments exceeding the 9.5 ppm preliminary remedial goal (PRG) for total PAHs. In the context of the FS, this alternative is labeled SED-4. There are four sub alternatives within the dredging family of SED-4, depending on whether 1) the dredging is performed mechanically or hydraulically, and 2) the dredge spoil is thermally treated or not. NSPW suggests these specific decisions should be deferred until the pre-design testing has been completed and all applicable design inputs have been fully evaluated. As stated in the Executive Summary of the FS, NSPW believes dredging (i.e., removal), as opposed to capping, provides "the most long-term benefit at the least cost and with the fewest short-term technical implementation issues."

While NSPW generally supports dredging of the bay sediments, there are at least <u>four</u> conditions or remedial design issues of which we are currently aware that critically impact NSPW's support for a cleanup requiring the bay to be dredged to the PRG.

The <u>first</u> design issue is that NSPW envisions a pre-design dredging effort will be needed to determine 1) how best to dredge (e.g., mechanical or hydraulic), 2) how to and whether it may be cost-effective and feasible to excavate in a relatively dry condition the contaminated sediment in the near-shore areas, and 3) how to safely and cost-effectively first remove the massive amount of wood debris encountered at the Site. It is estimated that 25,000 cubic yards of wood, bark, sawdust residues, etc. will have to be removed/managed in order to ultimately remove the impacted sediments.

The <u>second</u> issue relative to the dredging option is how to document the performance of this removal option while developing monitoring and management plans for a dredging remedy that avoids or dramatically minimizes the risk and cost of re-dredging. The Board is very knowledgeable regarding the management issues posed by dredging residuals, both "generated residuals" and "undisturbed residuals." These issues were discussed in the 2007 National Research Council's report on dredging of sediment at Superfund Megasites. At the August 12, 2008 meeting of the parties in Ashland, NSPW presented a dredging residuals management plan. The plan specifically includes confirmation sampling to assess performance of the dredging remedy relative to the PRG, and precise details for confirmation sampling will be refined during pre-design testing and the design phase.

The dredging residuals management plan proposed for the Ashland site is predicated on three factors:

1) <u>Accurate Identification of Dredge Prism</u>: Modern dredging control technology is sufficiently sophisticated that there is confidence that sediments identified for removal within the dredge prism will be dredged and removed, with the exception of generated dredging residuals. Once the dredge prism is properly established based upon historical sediment sampling, the potential for leaving a significant amount of undisturbed residuals is acceptably low. This is especially true if a conservative dredging prism is established with an appropriate allowance for overdredging. Only on-going real time visual confirmation using underwater video or diver inspection is needed to supplement the dredge control system verification that all areas within the dredge prism have been covered. This implies two things: a) modern dredge control technology using precise positioning systems and real time monitoring of dredge head and sediment bed elevation can ensure complete coverage of all areas within the dredge prism; and b) with the exception of needing to manage generated dredging residuals, the success of dredging is dependent primarily on proper characterization of the contaminated sediments and appropriate design of the dredge prism.

2) <u>Placement of Backfill and Post-Dredge Sampling</u>: Since re-dredging to capture generated dredging residuals has been demonstrated to be ineffective in many cases, all dredged areas will be backfilled with a six-inch layer of "fish mix" as a planned component of the dredging operation. Fish mix is a well-sorted, clean, sand and gravel mixture that will encourage fish spawning and recruitment of aquatic insects. Post-dredge sampling will be performed to the extent necessary to establish a baseline for the long-term monitoring program.

3) <u>Long-Term Operations and Monitoring Plan</u>: Recognizing the need for assessing and documenting the success or performance of the remedy, a long-term monitoring plan that will include periodic monitoring of contaminant levels in surface sediments will be developed and implemented. The long-term monitoring plan also will include contingency plans for implementation of additional remedial action (e.g., adding another six inches of fish mix) if surface sediments have not met the PRG within a reasonable time.

The third issue is whether dredge spoils and contaminated soil in general from the Site should be thermally treated. Historically, NSPW has thermally treated, where feasible, contaminated soil and debris from all three of the other MGPs it has remediated in Wisconsin. Therefore, NSPW contemplates thermal treatment at Ashland assuming fuel prices are not excessive and the treated soil is amenable for reuse in redeveloping Kreher Park. However, at this point (i.e., prior to the pre-design studies and final remedial design) it is premature to resolve this issue. Therefore, NSPW requests it be allowed to propose thermal treatment during the design phase after it has determined the specific media from the Ashland site that will be amenable to thermal treatment.

The fourth design issue is whether a permanent breakwater will be built prior to the dredging activity and who will fund the breakwater if it can be built before dredging. If a permanent breakwater cannot be built within the time allowed, a temporary, sheet pile barrier estimated to cost approximately $2.0 million will need to be built and subsequently removed to support either mechanical or hydraulic dredging within the bay.

By supporting the dredging remedy described in SED-4, NSPW is rejecting the other alternatives for sediment including the confined disposal facility (SED-2), the other hybrid alternative of partial dredging coupled with capping (SED-3), and the dry excavation alternative of the entire bay as identified as SED-5, commonly referred to as the "dredge in the dry" option. Although SED-2 and SED-3 may be somewhat less costly in the near term, NSPW believes they pose long-term operational and maintenance costs, thereby rendering them not to be cost effective relative to alternative SED-4.

Similarly, the full bay dry excavation alternative (SED-5) is deemed to be 1) no more environmentally protective than SED-4 in the long term once the fish mix is placed and the ecosystem is allowed to reestablish itself, 2) overly expensive, thereby not cost-effective, 3) fraught with technical challenges (e.g., holding back substantial depths of Lake Superior), 4) prone to exacerbate volatilization of PAHs and benzene, increasing exposure to construction workers and the community at large, and 5) excessive in duration (e.g., estimated to take four years to dredge in the dry versus approximately two years) for alternative SED-4.

Kreher Park

At the lakefront (i.e., Kreher Park), NSPW intends to contribute substantial funding to remove hot spot soil contamination as identified in the RI. Assuming thermal treatment is used where feasible, the applicable alternative from the FS would be S-5A. Following partial removal of the contaminated soils, NSPW recommends that Kreher Park will be partially capped and developed to support the City's Waterfront Development Plan.

The soil alternative for Kreher Park that must be unequivocally rejected by the Board is S-3B. That option would require the complete excavation of over ten acres of fill in Lake Superior at an estimated cost of $35 million. The fill includes a former city dump, huge quantities of wood debris (slabs, sawdust and bark) and thousands of cubic yards of relatively clean fill currently capping the area and preventing human contact with contaminated materials. The City owns this park and needs it to remain land to support 1) the existing marina, 2) the proposed expansion to the marina, and 3) the planned development of Kreher Park for other tourism, community activities, and economic development. Kreher Park is a integral and vital component of the City's Waterfront Development Plan.

NSPW further recommends that the shallow groundwater in the park be remediated via one of the *in situ* treatment methods described in the FS along with surface and vertical barriers establishing hydraulic control to avoid the recontamination of the lake sediments. The alternatives supported by NSPW are described and labeled in the FS as GW-2 and GW-6.

Filled Ravine and Area Occupied by the Existing Service Center

The RI documents PAH contaminated soils on the bluff in the vicinity of the former MGP; this area currently supports the garages and warehouses constituting NSPW's existing service center. In this area, NSPW is prepared to fully fund limited soil removal (hot spot excavation) in the particular areas of the filled ravine and the existing service center. This remedial action will require NSPW to relocate all or parts of the service center, demolish most of the current buildings, and then excavate the debris in the former gasholders and portions of the filled ravine. At this point, NSPW envisions thermally treating the soil as applicable. In the context of the FS this alternative is identified as S-5A.

The shallow groundwater on the bluff (not to be confused with the deep aquifer) should be remediated via vertical barriers, partial caps, and hydraulic controls. The FS identifies this remedy as GW-2A. This option could conceivably be coupled with in-situ chemical oxidation pursuant to alternative GW-6.

Copper Falls Deep Aquifer

The deep aquifer below the service center and former MGP is called the Copper Falls. In this area below the service center, NAPL extends from depths of approximately 30 to 70 feet. Fortunately artesian conditions restrict the migration of NAPL and related contaminants to the underlying aquifer. Although the RI determined that the groundwater flow from the upper bluff area is north toward Lake Superior, the lateral extent of contamination beneath Kreher Park is limited by a stagnation zone located between the shoreline and the face of the bluff. This stagnation zone restricts further contaminant movement to the north in the direction of the bay. Furthermore, there are no known human receptors to this NAPL plume.

As stated earlier, a low-flow (3 gpm) pumping system was installed in 2000 at the service center to recover NAPL from the Copper Falls aquifer. The groundwater entrained in the process is treated and discharged to the sanitary sewer system. To date the system has removed approximately 10,000 gallons of free product from the aquifer.

Free product recovery was further enhanced in 2006 through 2007 when NSPW participated in an EPA SITE Program demonstration of an *in situ*, chemical oxidation technique to treat groundwater and contaminated soil at the Site. EPA's report documenting that study concluded 1) contaminants of concern were reduced by the proprietary reagent, 2) native bacteria were not harmed by the product and hydrocarbon degraders appear to have increased as a consequence of the treatment, and 3) recovery of DNAPL by the existing system increased significantly after treatment.

Therefore, NSPW believes *in situ* treatment (GW-3) by the demonstrated reagent or other products appears promising for remediating this plume and should be endorsed by the Board. The specific technique to be used *in situ* has not been determined at this time but the FS identifies a number of promising technologies to be fully evaluated in the design phase. NSPW further advocates that the NAPL plume below the service center be remediated by continuing to operate the current tar removal system (GW-9A) pending the fully evaluated performance of the chosen *in situ* remedial action.

NSPW rejects the more costly approach of enhancing the current groundwater extraction as described in the FS as alternative GW-9B. Based upon the promising results of the SITE demonstration at this site, it would be logical to pursue this or similar promising, innovative technologies rather than abandon it in favor of developing yet another long-term pump and treat system. Alternative GW-9B is fraught with perpetual operational and maintenance costs and other burdens including restrictions on redevelopment of the upper bluff property. Thus, NSPW requests the Board support alternatives GW-3 coupled with GW-9A while rejecting GW-9B.

Conclusion

NSPW has worked long and hard on the Ashland/NSP Lakefront Site. Subject to agreement on certain important conditions, NSPW is ready, willing and able to proceed to clean up the Site in a cooperative manner with the EPA, WDNR, the City and other stakeholders. The remedies endorsed by NSPW in this statement favorably satisfy the nine CERCLA evaluation criteria and will result in 1) a timely and environmentally protective remediation of the Site, 2) a stronger local economy for the City as it implements its Waterfront Development Plan, and 3) a cost-effective cleanup plan. NSPW requests and urges the Board to support its recommendations, thereby promoting the timely, protective and cost-effective cleanup of the Ashland/NSP Lakefront Site.

WISCONSIN DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew J. Frank, Secretary
John Gozdzialski, Regional Director

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September 2, 2008

Mr. Scott Hansen
Remedial Response Branch, Region 5
U.S. EPA (SR-6j)
77 West Jackson Blvd.
Chicago, IL 60604

Subject: Comments to the Remedy Review Board on the Ashland Northern States Power Lakefront Superfund Site Feasibility Study

Dear Mr. Hansen:

The Wisconsin Department of Natural Resources (WDNR) appreciates the opportunity to provide comments to the Remedy Review Board. The WDNR, in accordance with the Cooperative Agreement between United States Environmental Protection Agency (USEPA) and WDNR has been asked to forward comments on the potential outcome of the Feasibility Study to the USEPAs Remedy Review Board.

Background

Contamination at the Ashland/Northern States Power Lakefront Superfund Site (Site) was discovered in the late 1989 when City of Ashland sewer plant workers were excavating a trench for a sewer line and encountered oils and tar in the soils and groundwater adjacent to the city municipal wastewater treatment plant and city park area. . Subsequent investigations carried out by the City of Ashland (City) determined widespread VOC and PAH contamination on their lakefront park property (Kreher Park).

In 1993, the Wisconsin Department of Natural Resources (WDNR) began investigating the contamination found on the City property using state-funded cleanup dollars. These investigations concluded that some of the contamination appeared to be consistent with wastes generated by operations at the historic manufactured gas plant located nearby.

In 1995, WDNR notified Northern States Power-Wisconsin (NSPW) that the Department considered the company a potentially responsible party (PRP) for that contamination. From 1995, NSPW, WDNR carried out investigations of soil, groundwater and sediment, as well as studied risks associated with the lake environment and completed a draft Feasibility Study for the Chequamegon Bay and Kreher Park portions of the site. Wisconsin Department of Health and Family Services (DHFS) staff have also completed assessments of potential health risks to people living near and/or using the site.

In 1999, a citizen's petition requested that the EPA assess the site and determine if it should be listed on the Federal Superfund National Priorities List (NPL). The site was proposed for listing in December 2000, underwent a public comment period, and was placed on the NPL in October 2002. In November 2003, NSPW signed an administrative order of consent agreeing to complete the investigations under EPA and WDNR oversight.

Since the 2002 NPL listing, NSPW has completed a Remedial Investigation and associated reports as well as submitted a Feasibility Study Report which is currently being reviewed by EPA and WDNR.

The Site includes several properties within the City of Ashland and about 16 acres of sediment and surface water in Chequamegon Bay. The properties include those owned by: NSPW; Canadian National Railroad; a portion of the City owned property including Kreher Park, public roads and the former wastewater treatment plant; an inlet of Chequamegon Bay; Our Lady of the Lake Church and School; and private residences.

The NSPW property, located on a bluff overlooking Kreher Park, is the site of a former manufactured gas plant that began operation in 1885, producing gas for street lighting and other residential and commercial uses. It ceased operation in 1947 when it switched to propane distribution.

Kreher Park did not exist before the late 1800s as the Chequamegon Bay shoreline was much closer to what is now the Canadian National Railroad corridor. Kreher Park was created by placement of various fill materials into the bay through the decades. The eastern portion was filled with sawdust, wood waste and other material from local sawmills that operated until the early 1930s. Solid waste, primarily demolition debris, was disposed of along the western side of the property in the 1940s.

Contaminants of concern at the site include tar, oil and other materials. Much of this material was generated at the former manufactured gas plant. Waste material moved from the former manufactured gas plant to the Kreher Park and/or Chequamegon Bay via a ravine, and later through a 12-inch clay tile pipe laid inside the ravine. Later, after Kreher Park was formed from fill, additional pipes and a ditch may have conveyed waste to Kreher Park and/or Chequamegon Bay.

Two interim measures have been implemented to date. NSPW began pumping ground water in 2000 from the Copper Falls aquifer, a thick water-bearing formation composed of layers of sand and gravel lying beneath the area as a pilot project. The pumped water is treated at the NSPW plant and discharged into the City's sanitary sewer. In 2002 NSPW dug out contaminated soil and waste at a seepage point at the base of the bluff and removed much of the 12-inch clay pipe in the ravine which was found to be the a transport route for NAPL from the MGP to Kreher Park and/or Chequamegon Bay. This area was then covered with clean material. NSPW also drilled a well to extract ground water and pump it to the treatment system on the bluff. To date, more than 1.7 million gallons of contaminated water has been pumped out, yielding about 10,000 gallons of a coal tar and water mix.

Site contamination
The investigation confirmed that contaminants are present in soil and ground water throughout the site, as well as in the sediment near the shore of Chequamegon Bay. The contaminants at the site include benzene, arsenic, lead and polycyclic aromatic hydrocarbons, or PAHs. Over time, the coal tar has separated into both floating and sinking plumes of "free product" contamination that does not readily mix with water. The floating portion typically contains the lighter volatile organic compounds such as benzene, while the sinking material contains the heavier PAHs such as naphthalene. Free product exists throughout the site including the filled ravine, Kreher Park fill, sediment, shallow ground water and the deeper Copper Falls aquifer. Additionally, contaminants in the aquifer have mixed with the water, creating a dissolved phase plume which extends from the former ravine to the bay. Finally, where contaminants have evaporated when exposed to air between soil particles, vapor has formed. These various phases and types of contamination, each with its own chemical and physical characteristics, complicate the cleanup process.

Lakebed

As stated above, the area that makes up Kreher Park and the bay area with contaminated sediments are all historic lakebed. Contaminants in Kreher Park are connected with the contaminants within the sediments. Any action taken in either area needs to "dovetail" with actions taken in the other.

Sediment

As with many sites that have areas of contaminated sediments, the sediment portion of this site includes concerns and challenges. One of the concerns to the WDNR regarding sediments is the volume and distribution of NAPL. The majority of the NAPL material exists within 300 feet of the current shoreline. The NAPL is covered with a layer of wood waste that appears to have been deposited after the initial release of the MGP (NAPL) waste. The NAPL constitutes a "source" for sediment and surface water contamination. When disturbed the NAPL releases to the water column causing both dissolved phase contamination and floating product. These phases will then adsorb to "clean" sediment particles causing in increase in contaminated sediment volume. In reviewing the sediment options in the Feasibility Study this issue is of great concern.

It is understood that during dredging activities re-suspension is a major design issue. This has been discussed in the 2007 National Research Counsel's report on dredging at Superfund Sites. The re-suspension of contaminated sediments discussed in the Research Counsel's report are a concern to the WDNR In the case of the Site the challenge is to remove the contaminated sediments without causing an increase in sediment contamination by disturbing the source NAPL in an environment where it contaminates relatively clean sediment particles that will settle out exacerbating the sediment contamination problem.

CDF and/or Capping

In evaluating any remedy for the site one of the threshold criteria that will be used in the assessment of the options is compliance with Applicable or Relevant and Appropriate Requirements (ARARs).

The Wisconsin Public Trust Doctrine established in Article IX, Section 1 of the Wisconsin Constitution, as interpreted by the Wisconsin Supreme Court and the Attorney General, requires that any development that involves the filling of lakes and streams must be substantially related to navigation or its incidents. Chapter 30.12, Wis. Stats. requires that a riparian owner may apply for a permit for any structure or deposit that is placed on the lakebed. In order for the Department to issue a permit for any structure or deposit on the lakebed it must be determined that the structure or deposit will not materially obstruct navigation, will not cause pollution will not be detrimental to fish and wildlife, and will not materially reduce the flood flow capacity of a stream, will not negatively impact natural scenic beauty and consequently will not be detrimental to the public interest.

The State of Wisconsin holds navigable waters in trust for all of its citizens and is responsible for protecting commercial and recreational navigation and public rights in navigable waters, including boating, fishing, hunting, swimming, and enjoyment of natural scenic beauty. Prevention of pollution and unhealthy conditions and protection of fish and wildlife habitat are among other public interests that the State is responsible to protect for the public. WDNR has previously stated our position that construction of a CDF on lakebed or on previously filled lakebed (the State retains jurisdiction of filled lakebed) in this fact situation is not in the public interest as it simply involves the capping of heavily contaminated material that should be properly removed and treated through an acceptable remediation alternative.

References to other in-water CDF's in Wisconsin are not appropriate comparisons, based on each fact situation and the nature and characteristics of the sediment and pollutant levels at each location. The Department has been consistent in its approach on similar projects involving Wisconsin waters of Lake Superior and its tributaries including the St. Louis River Duluth Tar Superfund site and Newton Creek-Hog Island Inlet. Contaminated sediments at other sites along Lake Superior have been removed to an acceptable clean-up level through dredging to permanently remove contaminants from the bed of the waterway.

Based upon the WDNR's evaluation a CDF or capping will not meet the threshold criteria of meeting Chapter 30.12.

Feasibility Study and State of Wisconsin Recommendations

For the purpose of the Remedial Investigation and Feasibility Study reports, the Site was divided into the following areas of concern:

1. Filled Ravine
2. Copper Falls Aquifer
3. Kreher Park
4. Offshore Sediments

It became clear during the Feasibility Study process that a "whole site" versus area of concern approach would add to efficiencies and effectiveness of the remedial options chosen for any specific area. Specifically we were looking at areas such as a whole site wastewater component or soil treatment or disposal rather than assessing each area separately. NSPW was requested to look at whole site scenarios of remedial options to more adequately assess the effectiveness of the options as well as look at the potential cost savings. The following is a brief discussion of each of the areas of concern and the Department's preferred approach to addressing contaminated media in each area.

Filled Ravine

Soils

The WDNR supports the removal of NAPL contaminated soils as well as the contaminated MGP structures to remove the source for on-going shallow groundwater contamination. Soils exceeding the PRGs for direct contact within the upper 4 feet of the soil column will need to be removed or capped with supporting land use controls. Off site disposal will be supported. NSPW can treat soils prior to disposal if shown in pre-design testing that it meets ARARs. The effectiveness of this option could be augmented with the use of an Insitu Chemical Oxidation (ISCO) technology similar to that tested during the Superfund Innovative Technology Evaluation (SITE) program.

Groundwater

Currently shallow groundwater (within the filled ravine) flows to the historic mouth at the seep area of Kreher Park. As part of an interim measure a recovery well was constructed near the mouth of the ravine to capture that flow. The effectiveness of the recovery well is not known but the flow fluctuates greatly during the year. It would be expected that soil/NAPL removal in conjunction with vertical barriers and an augmented groundwater recovery and treatment system could be effective. The effectiveness of this option could be augmented with the use of an ISCO technology similar to that tested during the SITE program.

Filled Ravine Preferred Approach:

S-5A	Limited soil removal
GW-2A	Containment using vertical barriers, and
GW-6	In-situ chemical oxidation with groundwater extraction

Copper Falls Aquifer

Significant NAPL extends from approximately 30 to over 70 feet below ground surface in the area of the former MGP In 2000 NSPW installed and interim measure consisting of 3 recovery wells pumping a total of 3 gallons per minute. The flow rate was based on what the local wastewater treatment plant would accept. The intent of the interim action was to assess the "pumpability" of the NAPL. To date approximately 10,000 gallons of NAPL have been recovered. Earlier NSPW estimates suggested there may be as much as 200,000 gallons of NAPL in this plume. The WDNR can support a groundwater option for the Copper Falls Aquifer that includes a more aggressive pumping strategy including more recovery wells and suggest that the effectiveness of this option would be augmented with the use of an ISCO technology similar to that tested during the SITE program.

Copper Falls Aquifer Preferred Approach	
GW-6	In-situ chemical oxidation, with
GW-9B	Enhanced groundwater extraction

Kreher Park (City owned property)
Kreher Park is filled in lake bed directly connected to the open waters of the bay. Hydrologic conditions allow water (and contaminants) to move in and out of the fill material into the lake and sediments. Any actions taken to remediate the sediments will need to be designed in conjunction with containment and treatment of the contaminants at Kreher Park to cut off the potential for re-contamination. Areas of free product contamination are wide spread across Kreher Park showing up as sheens during excavation but discrete areas of DNAPL exist at the "waste tar dump" and mouth of the filled ravine as "hot spots". Remediation (removal) of the hot spots and contaminant containment (groundwater and soil) through excavation and the use of sheet piling and groundwater pump and treat with the use of an insitu treatment would meet ARARs and the EPA criteria. Recognizing that historic fill has occurred to create Kreher Park and that the current use meets the intent of the Public Trust Doctrine, WDNR supports maintaining the existing shoreline at Kreher Park.

Soil
WDNR suggests that the removal of DNAPL hotspots and off site disposal. NSPW can treat soils prior to disposal if shown in pre-design testing that it meets ARARs.

Groundwater
Due to the direct hydraulic connection between the lake and the lakebed fill making up Kreher Park a complete hydrologic containment structure will need to be installed to control migration. This containment scenario will need to include a groundwater pump and treat component to maintain an inward hydraulic gradient. The effectiveness of this option would be augmented with the use of an ISCO technology similar to that tested during the SITE program. The entire site would require a cap to maintain appropriate separation for direct contact risks as well as to limit infiltration of precipitation and limit the amount of groundwater control needed.

Kreher Park Preferred Approach:	
S-5A	Limited soil excavation (hot spot) and off site disposal, with
GW-2	Vertical containment and
GW-6	In-situ chemical oxidation with groundwater extraction

Sediments

The contaminated sediment portion of the site contains the greatest challenges for site remediation. The sediments are made up of 2 distinct types of contaminant phases. The first, an area extending from the current shoreline out between 200 and 300 feet is oils and tars in the free product phase. This product exists as a potential source for further sediment contamination. As mentioned earlier, when disturbed the free product releases to the water column producing a dissolved phase in the water column and a floating phase (slick) on the waters surface. The challenge is to remove the sediments and free product in this distinct area without producing more contaminated sediments by introducing suspended sediment particles to the free product. In the outer less contaminated sediment area free product has not been encountered. In this area re-suspension remains an issue.

The WDNR supports a dredging alternative that removes PAH contamination to a concentration at or below the PRG of 9.5 ppm total PAHs. Both wet and dry dredging has been assessed in the Feasibility Study. Dry dredging has been used in Wisconsin waters to remove PAH (free product) contamination successfully. Wet dredging whether hydraulic or mechanical are also options. WDNR suggests that prior to the implementation of a wet dredge alternative for the free product area, pre-design pilot test be carried out documenting the effectiveness in suppressing the further production of contaminated sediments and meeting the PRG. If, through pre-design testing it is apparent that PRGs cannot be archived or NAPL redistribution is a problem then dry dredging should be required.

In order to assess the effectiveness of the sediment remediation and need for further dredging, a confirmation sampling plan needs to be designed that appropriately determines if the Preliminary Remediation Goal (PRG) of 9.5 parts per million of total Poly Aromatic Hydrocarbons (PAHs). Upon reaching the PRG, due to the clay/silt substrate, a layer of sand/gravel/cobble cover has been proposed. This layer will act to minimize turbidity during storm events as well as add some cover for fish spawning and allow vegetation to take hold.

Sediments Preferred Approach:
SED-4 or SED-5, or SED-6
Dependent on pre-design test studies the dredge option for either the NAPL area or the rest of the site must be shown to be effective at:

1. Meeting the PRG
2. Limiting the production of more contaminated sediments
3. Limiting re-suspension

As stated above, the supported remedial actions for the 4 areas of concern do not strictly fit into any of the 10 scenarios proposed in the Feasibility Study. They do fit under the basic Feasibility Study designations. Further, this scenario is consistent with the City of Ashland's Waterfront Development Plan.

In reviewing the Feasibility Study Report, the WDNR has applied the ARARs and used the 9 review criteria to look at options that reach the preliminary remediation goals, are protective to human health and the environment while remaining cost effective. We feel this approach is consistent with the National Contingency Plan and Wisconsin environmental laws. Thank you for the chance to comment on this issue. If you have any questions or comments please contact me at 715 635-4049 or james.dunn@wisconsin.gov.

Sincerely

Jamie Dunn
Hydrogeologist
Northern Region
Remediation & Redevelopment Program

Cc:

Connie Antonuk, Rhinelander
Tom Jerow, Rhinelander
Nancy Larson, Superior
John Robinson, Rhinelander
Brian Knapp, City of Ashland
Ed Monroe, City of Ashland
Deb Johnson, Madison LS/8
Mark Giesfeldt, Madison RR/5
Dave Donovan, NSPW
Jerry Winslow, NSPW
Rick Dowd, City of Ashland

Appendix A

ARARs

Table E-1 – ARAR Summary
For Potential Soil Remedial Alternatives

ARAR / TBC	Alternative S-2		Alternative S-3A and 3B		Alternative S-4A and S-4B		Alternative S-5A and 5B		Alternative S-6	
	Containment Using Surface Barriers		Limited and Unlimited Removal and Off-site Disposal		Limited Removal and On-site Disposal		Limited Removal and Ex-situ Thermal Treatment		Limited Removal and Ex-situ Soil Washing	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply
Chemical Specific										
RCRA – Definition of Hazardous Waste 40 CFR 261	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act National Primary and Secondary Ambient Air Quality Standards (NAAQS) 40 CFR Part 50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 61	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Hazardous Substance Spill Law and Soil Cleanup Standards Ch. 292.11, NR 720	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Groundwater Quality – WAC NR140	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Pollutant Discharge Elimination Systems - WAC NR 200	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Air Pollution Control Regulations – WAC NR 400-499	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Soil Cleanup Standards – WAC NR 720	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Guidance for Generic Soil PAH Cleanup Levels (WDNR PUBL-RR-519-97, April 1997)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Lab Certif. – WAC NR 149	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Action Specific										
CERCLA - Procedures for Planning and Implementing Off-site Response Actions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Subtitle D Non-hazardous Waste Standards 40 CFR 257	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Manifesting, Transport, and Record keeping Requirements 40 CFR 262	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	No	NA
RCRA - Wastewater Treatment System Standards 40 CFR 264	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Excavation and Fugitive Dust	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-1 – ARAR Summary
For Potential Soil Remedial Alternatives

ARAR / TBC	Alternative S-2		Alternative S-3A and 3B		Alternative S-4A and S-4B		Alternative S-5A and 5B		Alternative S-6	
	Containment Using Surface Barriers		Limited and Unlimited Removal and Off-site Disposal		Limited Removal and On-site Disposal		Limited Removal and Ex-situ Thermal Treatment		Limited Removal and Ex-situ Soil Washing	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply
Requirements 40 CFR 264										
RCRA - Storage Requirements 40 CFR 264, 265	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Air Pollution Control Regulations NR 400	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Solid Waste Management Regs NR 500	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	No	NA
WI Hazardous Waste Regulations – NR 600	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Invest. & Remed. of Env. Contamination – NR 700	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Guidance for Cover Systems (Cover Systems as Soil Performance Standard Remedies (WDNR PUBL-RR-709, Jan. 2007)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Guidance for Management of Investigation Derived Waste (Interim Guidelines for the Management of Investigation – Derived Waste (WDNR PUBL-RR- 556-93, May 1993)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Groundwater Discharge Requirements (Informational Document for Wisconsin Discharge Permit; Contaminated Groundwater from Remedial Action Operations (WDNR PUBL- RR-583-01, May 2001)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Management of Waste from Remediation of Manufactured Gas Plants (Draft Management of Waste from Remediation of Manufactured Gas Plants (WDNR PUBL – RR – 768, Feb 2007)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OSHA Occupational Safety and Health Standards	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DOT Haz Mat Transport	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI SPCC – NR 216	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-1 – ARAR Summary
For Potential Soil Remedial Alternatives

ARAR / TBC	Alternative S-2		Alternative S-3A and 3B		Alternative S-4A and S-4B		Alternative S-5A and 5B		Alternative S-6	
	Containment Using Surface Barriers		Limited and Unlimited Removal and Off-site Disposal		Limited Removal and On-site Disposal		Limited Removal and Ex-situ Thermal Treatment		Limited Removal and Ex-situ Soil Washing	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply
Location Specific										
Landfill Siting and Approval Processes WI Statutes Ch. 289	No	NA	No	NA	Yes	Yes	No	NA	No	NA
Solid Waste Management Regs – NR 500	Yes	Yes	Yes	Yes	Yes	Yes	No	NA	No	NA
To Be Considered										
WI Water Quality Regs – NR 300	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safe Drinking Water Act	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Lakes Water Quality Agreement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Water Act 303(d)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EPA Contaminated Management Strategy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EPA Contaminated Management Guidance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Lakes Water Quality Initiative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local Permits	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-2 – ARAR Summary for Potential Groundwater Remedial Alternatives

ARAR / TBC	Alt. GW-2 Containment using Surface and Vertical Barriers		Alt. GW-3 In-situ Treatment using Ozone Sparge		Alt. GW-4 In-situ Treatment using Surfactant Injection		Alt. GW-5 In-situ Treatment using Permeable Reactive Barrier Walls		Alt. GW-6 In-situ Treatment using Chemical Oxidation		Alt. GW-7 In-situ Treatment using Electrical Resistance Heating		Alt. GW-8 In-situ Treatment using Dynamic Underground Stripping/Steam Injection		Alt. GW-9 Removal using Groundwater Extraction Wells	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply						
Chemical Specific																
RCRA – Definition of Hazardous Waste 40 CFR 261	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act National Primary and Secondary Ambient Air Quality Standards (NAAQS) 40 CFR Part 50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 61	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Hazardous Substance Spill Law and Soil Cleanup Standards – Ch. 292.11, NR 720	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Groundwater Quality –WAC NR140	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Pollutant Discharge Elimination Systems - WAC NR 200	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Air Pollution Control Regulations – WAC NR 400-499	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Soil Cleanup Standards – WAC NR 720	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Soil Cleanup Standards – WAC NR 720	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Guidance for	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-2 – ARAR Summary for Potential Groundwater Remedial Alternatives

ARAR / TBC	Alt. GW-2 Containment using Surface and Vertical Barriers		Alt. GW-3 In-situ Treatment using Ozone Sparge		Alt. GW-4 In-situ Treatment using Surfactant Injection		Alt. GW-5 In-situ Treatment using Permeable Reactive Barrier Walls		Alt. GW-6 In-situ Treatment using Chemical Oxidation		Alt. GW-7 In-situ Treatment using Electrical Resistance Heating		Alt. GW-8 In-situ Treatment using Dynamic Underground Stripping/Steam Injection		Alt. GW-9 Removal using Groundwater Extraction Wells	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply						
Generic Soil PAH Cleanup Levels (WDNR PUBL-RR-519-97, April 1997)																
WI Lab Certif. – WAC NR 149	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Action Specific																
CERCLA - Procedures for Planning and Implementing Off-site Response Actions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Subtitle D Non-hazardous Waste Standards 40 CFR 257	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Manifesting, Transport, and Record keeping Requirements 40 CFR 262	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Wastewater Treatment System Standards 40 CFR 264	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Excavation and Fugitive Dust Requirements 40 CFR 264	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RCRA - Storage Requirements 40 CFR 264, 265	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Air Pollution Control Regulations – NR 400	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Solid Waste Management Regs –	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-2 – ARAR Summary for Potential Groundwater Remedial Alternatives

ARAR / TBC	Alt. GW-2 Containment using Surface and Vertical Barriers		Alt. GW-3 In-situ Treatment using Ozone Sparge		Alt. GW-4 In-situ Treatment using Surfactant Injection		Alt. GW-5 In-situ Treatment using Permeable Reactive Barrier Walls		Alt. GW-6 In-situ Treatment using Chemical Oxidation		Alt. GW-7 In-situ Treatment using Electrical Resistance Heating		Alt. GW-8 In-situ Treatment using Dynamic Underground Stripping/Steam Injection		Alt. GW-9 Removal using Groundwater Extraction Wells	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply						
NR 500																
WI Hazardous Waste Regulations – NR 600	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI Invest. & Remed. of Env. Contamination – NR 700	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Guidance for Cover Systems (Cover Systems as Soil Performance Standard Remedies; WDNR PUBL-RR-709, Jan. 2007)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Guidance for Management of Investigation Derived Waste (Interim Guidelines for the Management of Investigation – Derived Waste; WDNR PUBL-RR- 556-93, May 1993	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Groundwater Discharge Requirements (Informational Document for Wisconsin Discharge Permit; Contaminated Groundwater from Remedial Action Operations; WDNR PUBL- RR-583-01, May 2001)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Management of Waste from	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-2 – ARAR Summary for Potential Groundwater Remedial Alternatives

ARAR / TBC	Alt. GW-2 Containment using Surface and Vertical Barriers		Alt. GW-3 In-situ Treatment using Ozone Sparge		Alt. GW-4 In-situ Treatment using Surfactant Injection		Alt. GW-5 In-situ Treatment using Permeable Reactive Barrier Walls		Alt. GW-6 In-situ Treatment using Chemical Oxidation		Alt. GW-7 In-situ Treatment using Electrical Resistance Heating		Alt. GW-8 In-situ Treatment using Dynamic Underground Stripping/Steam Injection		Alt. GW-9 Removal using Groundwater Extraction Wells	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply						
Remediation of Manufactured Gas Plants (Draft Management of Waste from Remediation of Manufactured Gas Plants; WDNR PUBL – RR – 768, Feb 2007)																
OSHA – Occupational Safety and Health Standards	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DOT Haz Mat Transport	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WI SPCC – NR 216	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Specific																
Landfill Siting and Approval Process WI Statutes Ch. 289	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Solid Waste Management Regs – NR 500	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
To Be Considered																
WI Water Quality Regs – NR 300	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safe Drinking Water Act	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Great Lakes Water Quality Agreement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clean Water Act 303(d)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EPA Contaminated Management Strategy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EPA Contaminated Management Guidance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-2 – ARAR Summary for Potential Groundwater Remedial Alternatives																
ARAR / TBC	Alt. GW-2		Alt. GW-3		Alt. GW-4		Alt. GW-5		Alt. GW-6		Alt. GW-7		Alt. GW-8		Alt. GW-9	
	Containment using Surface and Vertical Barriers		In-situ Treatment using Ozone Sparge		In-situ Treatment using Surfactant Injection		In-situ Treatment using Permeable Reactive Barrier Walls		In-situ Treatment using Chemical Oxidation		In-situ Treatment using Electrical Resistance Heating		In-situ Treatment using Dynamic Underground Stripping/Steam Injection		Removal using Groundwater Extraction Wells	
	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply	Apply	Comply						
Great Lakes Water Quality Initiative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local Permits	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives

ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
Chemical Specific						
Clean Water Act Section 304, Ambient Water Quality Criteria, US EPA 1986	Yes	Yes	Yes	Yes	Yes	Yes
Clean Water Act Section 303, Water Quality Standards, 40 CFR 131	Yes	Yes	Yes	Yes	Yes	Yes
Clean Water Act Section 304, Sediment Quality Criteria, US EPA 1991	No	NA	No	NA	No	NA
RCRA - Definition of Hazardous Waste, 40 CFR 261	No	NA	No	NA	No	NA
Clean Air Act, National Primary and Secondary Ambient Air Quality Standards (NAAQS), 40 CFR Part 50	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act, National Emissions Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 61	No	NA	No	NA	No	NA
WDNR Water Quality Standards for Wisconsin Surface Waters, WAC NR 102-105	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Wisconsin Groundwater Quality, WAC NR 140	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Wisconsin State Air Pollutant Control Regulations, WAC NR 400-499	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Wisconsin State Soil Cleanup Standards, WAC NR 720	No	NA	No	NA	No	NA
WDNR Soil Cleanup Levels for PAHs Interim Guidance, WDNR PUBL RR519-97, April 1997	No	NA	No	NA	No	NA
Location Specific						
Rivers and Harbors Act, 33 CFR 320	Yes	Yes	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives						
ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
WDNR Designated Waters Special Natural Resources Interest, WAC NR 1.05(4) and Wisconsin Statutes 30.01(1 am)	No	NA	No	NA	No	NA
WDNR Landfill Siting and Approval Process, Wisconsin Statutes 289	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
WDNR Permits in Navigable Waters, Wisconsin Statutes 30	Yes	Yes	Yes	Yes	Yes	Yes
Local Permits (building, zoning, other)	TBD	TBD	TBD	TBD	TBD	TBD
Action Specific						
Clean Water Act Section 401, National Pollutant Discharge Elimination System	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
Clean Water Act Section 301(b), Effluent Standards- Technology Based Discharge Requirements	No	NA	No	NA	No	NA
CERCLA Procedures for Planning and Implementing Off-site Response Actions, 40 CFR 300.440	No	NA	Yes	Yes	Yes	Yes
RCRA- Manifesting, Transport and Recordkeeping Requirements, 40 CFR 262	No	NA	No	NA	No	NA
RCRA- Wastewater Treatment System Standards, 40 CFR 264	No	NA	No	NA	No	NA
RCRA- Storage Requirements, 40 CFR 264 and 265	No	NA	No	NA	No	NA
RCRA- Subtitle D Non-hazardous Waste Standards, 40 CFR 257	Yes	Yes	Yes	Yes	Yes	Yes
RCRA- Excavation and Fugitive Dust Requirements, 40 CFR 264	Yes	Yes	Yes	Yes	Yes	Yes
DOT Rules for Hazardous Materials Transport, 49 CFR 107-171	No	NA	Yes	Yes	Yes	Yes
OSHA Occupational Safety and Health Standards, 29 CFR 1910.120, 1910.132, 1910.134 and 1910.138	Yes	Yes	Yes	Yes	Yes	Yes
Clean Air Act National Primary and Secondary Ambient Air Quality Standards (NAAQS), 40 CFR Part 50	Yes	Yes	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives

ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
Clean Air Act National Emissions Standards for Hazardous Air Pollutants (NEHSHAP), 40 CFR 61	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Designated Waters of Special Natural Resources Interest, WAC NR 1.05(4) and Wisconsin Statutes 30.01(1am)	No	NA	No	NA	No	NA
WDNR Plans and Specifications Review of Projects and Operations, WAC NR 108	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Environmental Analysis and Review Procedures, WAC NR 150	No	NA	No	NA	No	NA
WDNR Laboratory Certification and Registration, WAC NR 149	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Wisconsin Pollutant Discharge Elimination System, WAC NR 200	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
WDNR Water Quality Antidegradation, WAC NR 207	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Water Quality Antidegradation: Waste Load Allocated, Water Quality-Related Effluent Standards and Limitations, WAC NR 212-220	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Lining of Industrial Lagoons and Design of Storage Structures, WAC NR 213	No	NA	No	NA	No	NA
WDNR Wisconsin's General Permit Program for Certain Water Regulatory Permits, WAC NR 322	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
WDNR Shoreline Protection, WAC NR 328	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Dredging Contract Fees, WAC NR 346	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Sediment Sampling and Analysis, Monitoring Protocol and Disposal Criteria for Dredging Projects, WAC NR 347	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Wisconsin State Air Pollutant Control Regulations, WAC NR 400-499	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Solid Waste Management, WAC NR 500-520	Yes	Yes	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives

ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
WDNR Hazardous Waste Management, WAC NR 600-685	No	NA	No	NA	No	NA
WDNR Investigation of Remediation of Environmental Contamination, WAC NR 700	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Notification of the Discharge of Hazardous Substances, WAC NR 706	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Public Information and Participation, WAC NR 714	No	NA	No	NA	No	NA
WDNR Standard for Selecting Remedial Actions, WAC NR 722	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Remedial and Interim Action design, Implementation, Operation, Maintenance and Monitoring Requirements, WAC NR 724	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Great Lakes Water Quality Initiative WAC 102 and 106 USEPA Great Lakes Water Quality Initiative, 1995	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Assessing Sediment Quality in Water Bodies Associated with Manufactured Gas Plant Sites, WDNR PUBL-WR-447-96, March 1996	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Guidance for Cover Systems as Soil Performance Standard Remedies, WDNR-PUBL-RR-709, April 2004	No	NA	No	NA	No	NA
WDNR Consensus-Based Sediment Quality Guidelines: Recommendations for Use and Application Interim Guidance, WDNR-PUBL-WT-732, 2003.	Yes	Yes	Yes	Yes	Yes	Yes
WDHFS Health-Based Guidelines for Air Management, Public Participation and Risk Communication During the Excavation of Former Manufactured Gas Plants, 2004	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Sediment Remediation Implementation Guidance Strategic Directions Report, 1995	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Low-Hazard Solid Waste Exemption, Wisconsin Statutes 289.43	Yes	Yes	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives

ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
WDNR Interim Guidelines for the Management of Investigation-Derived Waste, WDNR-PUBL_RR-556-93, May 1993	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Informational Document for Wisconsin Discharge Permit; Contaminated Groundwater from Remedial Action Operations, WDNR-PUBL-RR-583-01 May 2001	No	NA	No	NA	No	NA
WDNR Draft Management of Wastes from Remediation of Manufactured Gas Plants, WDNR-PUBL-RR-768, February 2007	Yes	Yes	Yes	Yes	Yes	Yes
To Be Considered						
US EPA Contaminated Sediment Management Strategy, EPA-823-R-98-001	Yes	Yes	Yes	Yes	Yes	Yes
US EPA Contaminated Sediment Management Guidance, EPA-540-R-05-012	Yes	Yes	Yes	Yes	Yes	Yes
US Public Health Service, Agency for Toxic Substances and Disease Registry (*no citation*)	Yes	Yes	Yes	Yes	Yes	Yes
Clean Water Act Section 118(c)(7), Great Lakes Critical Program Act of 1990-Assessment of Remediation of Contaminated Sediments (ARCS) Program, 40 CFR 132 Appendix E	Yes	Yes	Yes	Yes	Yes	Yes
US EPA Contaminated Sediment Management Strategy, EPA-823-R-98-001	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Beneficial Reuse Solid Waste Exemption, WAC NR 500.08	No	NA	Yes	Yes	Yes	Yes
Clean Water Act, Section 404, Dredge and Fill Requirements-Inland Testing Manual	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
WDNR Dredge and Fill Requirements, 1985 and 1990	Yes	Yes/permit	Yes	Yes/permit	Yes	Yes/permit
WDNR Solid Waste Management, Beneficial Reuse Solid Waste Exemption, WAC NR 500.08	No	NA	Yes	Yes	Yes	Yes

Table E-3 – ARAR Summary for Potential Sediment Remedial Alternatives

ARAR/TBC	Alt. SED-2		Alt. SED-3		Alt. SED-4 and SED-5	
	Dredge, place in CDF		Dredge, Cap		Dredge-All	
	Apply	Comply	Apply	Comply	Apply	Comply
WDNR Assessing Sediment Quality in Water Bodies Associated with Manufactured Gas Plant Sites, WDNR PUBL-WR-447-96, March 1996	Yes	Yes	Yes	Yes	Yes	Yes
WDNR Consensus-Based Sediment Quality Guidelines, Recommendations for Use & Application, Interim Guidance, WDNR PUBL-WT-732, 2003	Yes	Yes	Yes	Yes	Yes	Yes
International Joint Commission (IJC), IJC, 1992	No	NA	No	NA	No	NA